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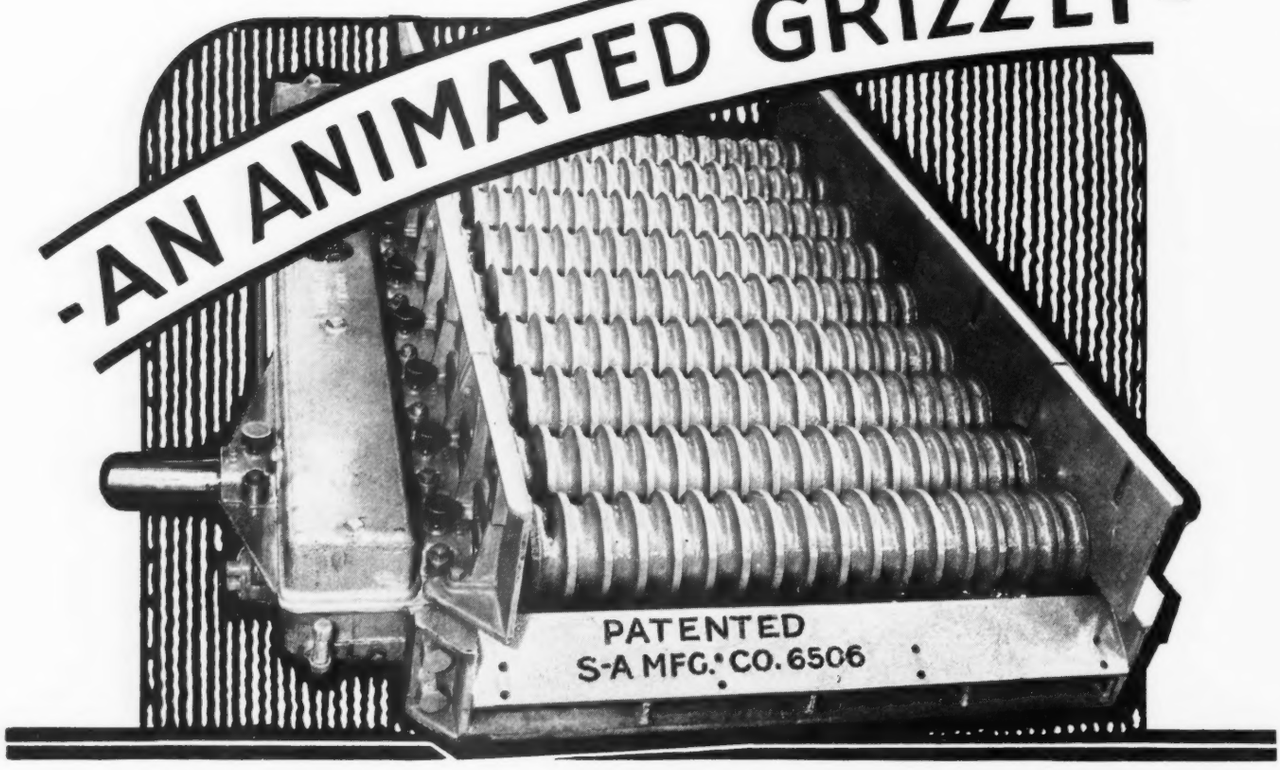

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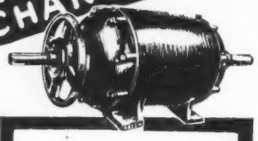

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Contents

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Editorials 401
- How America Dominates in Metals
- Studying the Labor Turnover
- Possible Outlet for Chilean Copper
- Profits from Russia
- Duping Prospectors With False Assays
- The Ashio Cherry Trees
- The Taxpayers' Association
- More Geophysical Prospecting

***Domestic Manganese and the Tariff** 404
By Richard H. Brown

***Classification of Modern Stoping Methods** 405
By Charles A. Mitke

***Giant Rolls—A Phase in the Development of Primary Breakers** 410
By W. T. W. Miller

***The Cortez District Rejuvenated** 413
By J. O. Greenan

Discussion 417
- "Der Flotation-Prozess"
- A Lead Mine Operator Replies
- Information Wanted on Lower California

Mining News 419
- Greater Federal Recognition for the Mining Industry
- Anaconda Team Wins First-Aid Contest
- New Interest in Oatman District
- Funds for Prospectors Available in Alaska
- Sales Agency Idea Revived in Joplin-Miami District

Societies, Addresses and Reports 426
In Canada With the Empire Mining Congress
By Arthur B. Parsons

Personal Notes 429

Obituaries 429

Recent Technical Publications 430

Market and Financial News 432

New Patents 433

Market Report 433

Metal Price Curves 435

Review of Metal Statistics 436

E. & M. J. Statistics of Mining Industries 437

Mining Stocks 438

Modern Equipment 439

Professional Directory 37-39

Searchlight Section 41-43

What and Where to Buy 44-46

Advertising Index 48

*Illustrated Article

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How America Dominates in Metals

A STATISTICAL STUDY of the mining industries of the world impresses on one the outstanding importance of the United States, both as a producer and consumer of metals. In copper, the United States last year produced 54 per cent of the world's total, and consumed about 52 per cent of that used by the world; the percentage of lead produced was 40, and of lead consumed, 44; of zinc produced, 46 per cent, and of zinc consumed, 43 per cent of the world's consumption. The country also produced 24 per cent of the world's silver, 12 per cent of its gold, 52 per cent of its iron and steel, and about a third of its aluminum; also consuming equally important proportions of these metals, though consumption statistics are not at hand. In recent years the United States has been accountable for practically all of the increase in the use of most of these metals. In 1926, for example, the world's consumption of copper, lead, and zinc was 1,020,344 metric tons greater than in 1913, and of this increase the United States was responsible for all but 85,500 tons.

The question that economists are asking with regard to these statistics is: will the United States continue so to dominate as a producer and as a consumer of most of the metals, or will other countries forge ahead in the years to come as has the U. S. A. in the immediate past? The indications are that though the United States may continue to gain in actual tonnage, a larger proportion of metal production will gradually go to other countries, now being developed and to be developed. From the consuming standpoint, also, it is a fair assumption that other parts of the world will become relatively more important than they now are, for with the development of natural resources that is now going on in other countries, and the steps that are being taken towards the greater efficiency of human effort, a higher standard of living should result, which will go hand in hand with increased utilization of metals. The great nations of Europe are now using a surprisingly disproportionate amount of metal, compared with the United States, as the following table shows:

Consumption per Person, in Pounds, in 1926

	Copper	Lead	Zinc
United States	16	13	10
France	6	5	6
Germany	6	5	5
Great Britain	7	12	8

Saturation points are often mentioned in connection with the automobile industry, and it is pointed out that even though the United States may be near that point, there is a vast potential market abroad. The same may be said for the metal mining industry. Here, there is no saturation point, properly speaking, for the per-capita consumption of metals is unlimited, but the potential outlet is much greater abroad than here.

A business depression in the United States would curtail metal consumption in this country, but prosperity abroad might easily offset this decrease. Foreign as well as domestic conditions must be studied and improved, for they will have a decided effect on even an insignificant mining camp, whether it be in Arizona, Alaska, Chile, or India. Such efforts as that of the International Economic Conference at Geneva are thus important to every mining man.

Studying the Labor Turnover

THE day is past when excessive labor turnovers are viewed with equanimity. Once the employee who left was apt to be treated with indifference, especially if there were many "rustlers" at the gate. Hiring and firing were left largely to the foreman, and if his ways of handling men were faulty it was likely to escape the attention of those above him. But leaner ores and an increasing scarcity of new deposits have long since brought about a new religion in the mining industry. Labor problems receive attention as well as those of a technical kind, for they, too, affect the profits. A high labor turnover has its exact equivalent in dollars lost, even though an exact appraisal of the loss be impossible to make.

First in the course of investigating an excessive turnover is to find out why the employees quit. The method of doing this is simple—ask them. The exit interview, as it has been called, is of much importance. Conducted by a third person it serves as a check upon the shift boss or foreman or whoever has been the immediate superior of the employee who is throwing up his job. It may show that the man has not been assigned to the work for which he is best fitted. Tact and courtesy in most cases will bring out the real reason for the man's dissatisfaction. Also, even though he persists in his intention to go elsewhere, he will have kinder feelings toward his late employer.

It does not pay to train employees for some one else. A company's efforts with its men amount to just that whenever the latter quit after working for a few weeks, or months, or even a year. The large mining companies have long since realized this and have given careful attention to their problems involving industrial relations. The small operator with only a few men to handle is in such intimate contact with them that the matter for him has slight importance. But in between these two groups of the very large and the very small is a third group of operations that are too small to be highly organized but at the same time too large for the superintendent to be in intimate contact with all his men. The companies in this group will find it profitable and possible in many instances to improve their relations with their employees and to seek the causes if their turnover be unduly high.

A Possible Outlet for Chilean Copper

A SUBSTANTIAL PART of the increased output of Chilean copper might well be absorbed right in the country of origin in the form of electrical equipment and transmission lines manufactured in the United States. In recent years the United States has made large loans to Chile, with at least one obviously satisfactory result: the construction of the modern electric railroad between Valparaiso and Santiago, its extensions, and the necessary power plants. This stretch of line is a credit to Chile, and a fine advertisement in South America of American engineering skill and the American electrical industry. The money was well spent, and large amounts of copper were used directly in its construction.

The traveler from Valparaiso to Buenos Aires, however, unless climatic conditions have been favorable, has no difficulty in distinguishing where efficiency ends. At Los Andes, in the foothills, he transfers to a small, slow, and uncomfortable steam-driven train, and later he may have to take to a mule for six hours or so to negotiate the worst stretch across the Andes in winter time. As he proceeds on his uncomfortable journey he will have ample opportunity to meditate how the trip between Chile and the Argentine could be improved if the engineering problems were placed in capable hands and an adequate amount of capital to provide for the numerous improvements so badly needed were deflected into the proper channels. Thus and thus only could the traffic be quadrupled.

The Chilean nitrate industry is slowly recovering, but almost all the properties are handicapped by the high cost of power, an inevitable result of the operation of small individual power plants. A glance at the map of Chile will show how geographical conditions there favor the establishment of coastal power plants, the electrification of existing nitrate railroads, and the distribution of current to the nitrate *oficinas*. It will be maintained that steam is necessary in the operation of a nitrate deposit and plant of normal size. This is true in a general sense; but the amount required for an operation that is 40 per cent more efficient than has been attained by former methods is extremely small, developments in recent years having demonstrated that the heating and boiling of the leach liquor in contact with the raw material is costly, wasteful, and unnecessary. If some of the money loaned to Chile were spent on the erection of efficient seacoast power plants, a step that would help the electrical industry in the country supplying the funds, provide an outlet for Chilean copper, and serve to encourage and stabilize the exports of nitrate, the results would benefit all concerned.

Chile possesses large beds of coal, the development of which has been delayed because of lack of adequate capital and the avoidance of utilizing American engineering advice and equipment. Sooner or later the country must "put its house in order," if it wishes to benefit from the possession of valuable and accessible natural resources. The problems involved necessitate consideration of the latest practice in mining, mechanical, transportation, and electrical engineering, and the utilization of efficient equipment. As a direct result, the Chilean nitrate and copper industries will both benefit; and American bankers will have the moral and tangible satisfaction of having advanced the prosperity of a country with which the people of the United States are desirous of remaining on the friendliest terms possible—a condition that is out of the question so long as industrial prosperity here can be contrasted with depression and economic chaos in Chile.

Profits From Russia

AT A GENERAL MEETING of the Lena Goldfields, Ltd., held recently in London, the Chairman, Herbert Guedalla, addressing the shareholders, said: "We have gone back into Russia purely as business people, and have been treated as such by the Soviet government." The net profits of the company's operations during the thirteen months covered by the accounts amounted to £267,888; although this is but a small percentage on the capital, it is nevertheless highly significant that profits are already being made. The company has established itself in Russia by the adoption of a conciliatory attitude and by showing an exceptional readiness to make concessions to the Soviet government's viewpoint and demands. The chairman's statement would appear to indicate that a *modus vivendi* has been found. Naturally, an immense amount of reorganization and reconstruction work remains to be done, but the profit already made, although small, is encouraging, and a successful continuance of the company's operations would prove, on an international scale, the principle which has long been accepted among individuals—namely, that it is both possible and profitable to do business with men whose political convictions differ widely from one's own. Business integrity, is, however, required.

As the metal reserves of the already explored portions of the world become depleted, attention must more and more center on the vast untouched territories of the Union of Soviet Socialist Republics. Mining men who worked in Siberia in pre-war days have some idea of the enormous potentialities of the country. Foreign capital is waiting to be poured into Russia as soon as the Soviet government definitely proves itself amenable to accepted standards of business dealings. The New Russia is standing before the bar of world opinion, and the final verdict will be based largely on her treatment of these pioneer concession holders.

Duping Prospectors With False Assays

AT A RECENT MEETING of mining engineers in the Northwest, Dean C. E. Newton of the Oregon School of Mines denounced certain assayers who make a living largely by finding rare metals in rocks brought to them by prospectors. Cases of such dishonorable practices are no doubt rare and not one in ten thousand assay returns are deliberately faked. Nevertheless, the speakers at the meeting mentioned have done public service in drawing attention to even isolated instances of so disreputable a practice. Faking an assay would be a particularly gross form of dishonesty under any circumstances, but when such a deceit is practiced on the prospector, who is, of all men, the least prone to question a favorable assay certificate, and false hopes followed by bitter disappointment result, no words are sufficiently strong to describe this brutal form of malpractice.

Assayers conducting public assay offices are in a position of especial trust: their standing in mining is analogous to that of the doctor in the social community; but whereas doctors are compelled to have a state license, there are still many places in the United States where the law allows anybody so minded to set up an assay office. The vast majority of reputable assayers would welcome some form of licensing legislation. If assayers were compelled to be licensed, any malpractice should involve the cancellation of the offender's permit and the closing down of his business so that the prospector and the public would be adequately protected against the false assay certificate and the endless trouble which it may involve.

The Ashio Cherry Trees

IN THE country adjacent to the Ashio copper smelter, in Japan, practically all vegetation was killed many years ago by smoke and fume. Afterward, the smoke nuisance was eliminated, but the soil remained barren, as it is at several plants in America. In an effort to redeem this waste land, cherry trees were planted, these being apparently resistant to acid conditions of soil and atmosphere, and of strong growth. As a consequence the Ashio district is famous for miles around for its beautiful cherry trees as well as for its copper mines and smelter, and the barrenness of the country is only a memory.

In America much has been done to beautify and put to practical use the land adjacent to mines and smelters, which is usually unattractive naturally. During the war, particularly, the making of vegetable gardens was encouraged, as witness those at Miami, Ariz. Perhaps less effort has since been expended in the practical utilization of such land, though many mining companies give prizes for sightly and useful gardens, and have laid out attractive small parks and golf courses. More attention might well be paid to this subject. Doubtless the unusual conditions of soil, water, and atmosphere about many mining properties are specially suited to certain species of vegetation, such as the cherry trees of Japan. Experimental work of this kind would not entail a great expense and would be most interesting and valuable. Sulphur in some of its occurrences is known to be an excellent fertilizer, and many mines, mills, and smelters have more of it than they know what to do with in such forms as acid mine water, barren pyrite mineral, or sulphur dioxide gas.

The Taxpayers' Association

IT WAS the tremendous increase in taxes that was responsible for the spread of the organization idea among taxpayers, said A. G. Mackenzie at the Mining Congress meeting in Washington last December. He was speaking of the value of taxpayers' associations in solving state and local fiscal problems. These associations were doing much to put better business methods into public affairs, he said. The idea had had its most general manifestation in the Western states where the demand for public improvements was about as fully met as elsewhere, although taxable resources were considerably less.

But there has been a high mortality in taxpayers' associations' according to the National Industrial Conference Board, which has recently made a study of this characteristically American phenomenon of public initiative in governmental affairs, as it terms it. Of about one hundred such associations organized or in existence in the United States in the last four years, it finds, less than one-third are still alive.

What is it that has caused their disappearance? Generally speaking, the Board reports, the associations which have survived are those that limit their objectives to curbing extravagances in public expenditures. Those that have shown the greatest mortality rate are the ones that have tried to reform the fundamental tax system or to bring about changes in rates or tax burdens, and which frequently have been one-man affairs, managed by enthusiastic reformers.

The reason for this is at once apparent. The latter group of associations have been altogether too ambitious. It is far easier to kill a proposal for spending public money than it is to stimulate heavy thinking on an economic subject by legislators who have not been elected to office because of their mental facility in dealing with complex problems.

Active associations of state-wide scope today exist in at least twenty-two states and are most prevalent in the West, the Conference Board reports. Fifteen Western states have organizations that are active in the field of state finance. Several of these, notably those of Arizona and California, have created networks of local associations throughout their states with branches in many of the counties. Minnesota has its association, which certainly seems much needed, when one views the outrageous taxation to which iron-mining companies there are subject. On the other hand, Michigan is not reported in the list.

More Geophysical Prospecting

THE forthcoming bulletin of the U. S. Bureau of Mines concerning the principles involved in geophysical methods of prospecting should throw considerable light upon a subject which has been viewed by most mine operators as being altogether too deep for them. Numerous companies have, of course, employed one or more of these methods, but results obtained in these instances have frequently not been made public, and few data of this nature have therefore been available for consideration of the industry as a whole. Further, no textbooks in English have been published.

A thorough study of the subject by a disinterested party has been needed—a study which will afford the industry explanations of the different methods and their fields of application, knowledge of geological conditions to which they are amenable, and the manner in which the physical data obtained should be interpreted. With this information public, and with certain principles bearing the indorsement of the Bureau's staff, the amount of geophysical prospecting done should increase materially. Also, whether or not the Bureau extends its study into the field of pure research, which work might evolve new methods or a perfection of present ones, credit should be given the geophysical prospecting companies now in the field for their pioneer work and the results that they have achieved in many different mining districts.

Domestic Manganese and the Tariff

By Richard H. Brown
Chairman of the Board
American Manganese Producers' Association

Mr. Brown is also president of the Trout Mining Co., of Philipsburg, Montana, an important producer of manganese ore, and president of the Manhattan Electrical Supply Co., of New York, a prominent consumer. He speaks therefore from a varied experience and an unbiased viewpoint.

RICHARD H. BROWN

THE American manganese situation as affected by the tariff has an importance not only for those interested in producing or using manganese but for the country at large. Manganese mining in the United States is relatively new. During the war, however, the rapid increase in the production of this mineral that is so essential in making steel demonstrated the existence of an important reserve and strongly suggests the practicability of eventually taking from the ore deposits which are found in a dozen places in Montana and in Minnesota, Colorado, and Virginia, much, if not all, of the manganese that this country requires.

To this there is but one drawback, and that is that with so low a tariff as that which prevails, American ores cannot be mined and concentrated with sufficient economy to justify large production in competition with foreign ores at the present stage of our knowledge of manganese ore beneficiation. Happily, there is substantial reason to believe that unless the industry is dealt a mortal blow by a decrease or abolition of the tariff it will not be long until processes are evolved that are sufficiently economical to enable American mines to supply American demand.

GOOD PROGRESS is being made in research applied to low-grade ores. Moreover, the University of Minnesota is engaged in a definite study of ores of the higher grades that is likely to bring excellent results. The universities of the other states in which manganese deposits exist will undoubtedly take up similar studies where they have not already done so. Other agencies also are being attracted to efforts to discover cheaper and more practicable ways of concentrating manganese ore.

The use of manganese ores is practically limited to steel manufacture, though relatively small quantities are used in manufacturing dry-cell batteries and chemicals. All told, about 800,000 tons of these ores are employed annually for these purposes in the United States, and, where employed, they are an essential which knows no substitute. In 1925 the output was about 100,000 tons, or about one-eighth of our requirements. In 1918, the last year of the war, the output was three times this amount.

The meager tariff which now enables the American manganese miner to live (and his living is not a luxurious one) adds to the cost of the manufacture of steel only 16 cents a ton; to the cost of the farmer's plow, a quarter of a cent; to the cost of the carpenter's hammer probably not a mill; and even to the gentleman who enjoys the comfort of a heavy motorcar probably not a dollar when he makes his purchase. And as to him who rides in a Ford or a Chevrolet, a single dime would probably cover the addition he would have to make to the price of his purchase.

Who wants to remove the tariff? Would any farmer, carpenter, or automobile owner complain of this trifling tax? Certainly, no steel manufacturer should complain, for to him it is not only insignificant, but he can pass it on to the consumer. Who, then, wants to remove the tariff? I venture to answer that only those monetarily interested in foreign mines or their operations or those who would cause the domestic mines to close down for the purpose of buying them in at destruction prices, which, when accomplished, would surely be followed by their appeal for the restoration of the tariff.

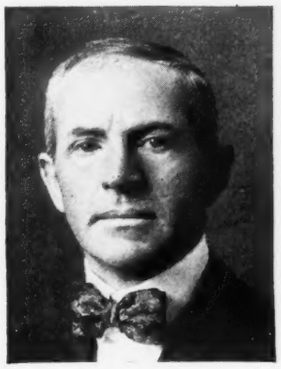
All the elements persuasive of the desirability of the American tariff policy converge to support our appeal for the continuance of the tariff on American manganese ores. The encouragement of related scientific research, the saving of the life of an essential industry, the receipts which go into the American Treasury, all combine to deny loudly the unjust plea of those who would decrease or remove the tariff.

THERE are few American industries which would not suffer from the abolition of tariffs in their respective products, with the ensuing competition supported by cheap foreign labor. I doubt if there is one which makes so logical an appeal for the meager protection it receives as American manganese. In my opinion, it would supremely serve the public interest to increase the tariff to induce broader and more industrious research the more quickly to develop the industry to the place of importance that it is destined to reach in the United States.

Classification of Modern Stoping Methods

By CHARLES A. MITKE

Consulting Mining Engineer, Phoenix, Arizona



C. A. MITKE

PRESENT stoping methods are the result of evolutionary development. Early mining included only a few basic methods of ore extraction, and operations were hampered by a lack of mechanical equipment and a knowledge of modern explosives. Production, however, was small; labor was cheap; comparatively little value was placed on life; and the cost of supplies was low. Gophering was largely resorted to for the mining of narrow veins and of small, spotty, high-grade orebodies, even to considerable depth. In large deposits, open-stope and room-and-pillar methods were the rule; and, where the ore and surrounding walls were heavy, and would not stand unsupported, walls of dry rock or masonry, or a form of drift mining with fill, were used extensively.

As time went on, standards of living gradually rose, necessitating the payment of higher wages, and this condition called for improved mining methods to lower the cost per pound of metal produced. The general adoption of the rock drill revolutionized the speed of breaking ground and had a marked effect upon costs and tons per man, while mechanical ventilation in deep, hot mines increased production from 20 to 50 per cent. This necessitated changes in methods of handling the ore, and greater attention was given to details, such as trackage, cars, mechanical dumping devices, and underground storage facilities. Advantage was also taken of the principles of gravity in the transportation of ore from stopes to cars, and wherever the size of the deposit warranted, electric motor haulage was substituted for hand and mule tramming.

Meanwhile, the demand for metal, particularly copper, increased by leaps and bounds, and, as it was an impossibility for the former high-grade deposits to meet the demand, the large low-grade, or porphyry, deposits, formerly considered to be of no commercial value, received attention and were finally developed. Large-scale production, at a low cost, was necessary in order to make the low-grade deposits profitable, because, with the old-time mining and milling methods, immense daily tonnages were out of the question. Therefore, to meet this new condition, and also to take care both of those high-grade mines which were gradually becoming low-grade, and of the ever-increasing cost of wages and supplies, it became necessary to devise methods of ore extraction which would be more rapid and cheaper.

A wider use of the principles of gravity, as applied to ore flowage, has resulted in the well-known success of the caving methods in low-grade mines, and in modifications of methods employing fill in the higher-grade mines. Other contributing factors have been the substitution of mechanical devices for hand labor, the application of scientific knowledge, and standardization, all of which have been of material assistance in enabling a man to produce, with the same effort, a much larger tonnage than formerly.

Though radical changes have taken place as regards the type and cost of labor, methods, and equipment employed, the character of the ground remains the same, and original extraction methods, which, of necessity, were based on ground conditions, form the basis of our present stoping methods.

As time has passed, the original methods have been improved upon, and this process is continuing today; frequently two or more basic methods, or variations of methods, are combined. However, as each improved detail of basic methods is tried out and adopted, instead of being treated as a variation of the parent method, it is, in the majority of cases, given a new name and looked upon as an entirely new method of ore extraction.

PRESENT TERMINOLOGY CONFUSING

A glance at a complete list of methods of ore extraction in present use discloses a bewildering array of stoping methods. One comparatively recent tabulation indicates more than *one hundred and fifty* different methods, variations, or combinations of methods. Unfortunately, as previously stated, as these numerous variations were developed, instead of describing them as variations of the original, or basic, methods, no consistent plan of naming them has been adopted. The result is most perplexing, as the mining community is now confronted with a large number of names and terms which are not descriptive of the methods that they represent, but are confusing not only to one who has not had actual experience in mining operations but also to a good many practiced operators. Sometimes a new variation is given the name of the foreman or official who first generally applied it in his mine, as witness the "Mitchell Stoping Method"; or it is sent forth under the name of the district or mine in which it was first used, as "Ohio System of Caving," "Morenci Mining Method," "Miami Caving Method,"

and so it goes. Various camps may have a different term for the same method. For instance, exactly the same method of ore extraction, carried out in identically the same manner, will be known by one name in one camp and by an entirely different name in another. "Square sets with slides," in use in one camp, is known as "Timbered rill" in another camp only 150 miles away. The terms "square set," "cut and fill," "top-slice," "shrinkage," and "caving" to a certain extent define the operations implied, but of the multiplicity of other titles now in use few are descriptive of the work they cover.

Only by going back to *fundamentals,* commencing with a study of original or basic methods, and conditions governing their evolution, and proceeding from these to their many variations, is it possible to obtain the proper perspective. When this is done, it will be found that practically all *present stoping methods* can be classified under a *few general divisions,* and that, though the numerous variations and combinations referred to above bear entirely different titles, they differ from the original, or parent method, only in some minor detail. For example, timbered rill stoping is really a form of incline cut and fill with, generally speaking, square-set timbering; the branch-raise system is merely a variation of caving; and the Mitchell Stoping Method is a combination of square-setting and underhand pillar work.

Ground "Hard," "Soft," or "Medium"

The common and universally adopted classification of ground is "hard," "medium," and "soft." Though this does not meet the situation adequately, as hard ground in one camp may be considered medium in another, nevertheless, even with its very evident limitations, it is the only classification that has received general recognition to date. There are several local classifications which go into the subject more extensively, and are quite elaborate, but, so far, they have not been adopted outside of their own locality or beyond the range of company supervision.

The major operations involved in all mining are *breaking* and *removing* ground. As shafts are sunk and tunnels and drifts driven, the question of *ground support,* which arises through the removal of broken rock, must receive consideration. *Ore extraction* is really a continuation of the operations of breaking and removing rock, but with a greater problem as regards ground support, as the excavations made through stoping are larger than those caused by sinking, drifting, or raising.

As soon as the work of extraction starts and the ore is removed, a cavity is formed, the dimensions of which keep on increasing in proportion to the volume of ore taken out. Within certain natural limits, cavities in hard ground will generally stand open, and little or no ground movement results; the roof and walls of cavities in medium ground are more susceptible to caving; whereas those of cavities in soft ground nearly always break and cave.

All methods of ore extraction may, therefore, be classified under two major heads[1], *Supported Stopes* and *Caved Stopes.* A supported stope is one in which the walls and roof, or back of the cavity formed by the extraction of ore, are supported in some manner, either naturally or artificially, and not allowed to cave. A caved stope implies the forced caving of both ore and overburden, as in the case of the various branch raise and combined shrinkage and caving systems; or of the overburden only, as in the case of top-slicing.

[1]F. W. Sperr, *Mining & Scientific Press,* April 7, 1917.

Supported stopes may be subdivided into those stopes which stand open, either because of natural support, or through artificial aid in the shape of rock walls, pillars of ore, or occasional stulls, and those stopes which require a large amount of waste fill to support permanently the back and walls. The former are primarily *open stopes,* whereas the latter are necessarily *filled* through the process of replacing the ore with waste. The two subdivisions of supported stopes are, therefore, classified as *open stopes* and *filled stopes.*

Open Stopes

An open stope is a cavity from which the ore has been extracted, and no filling put in, the only support for the back being occasional posts, rock walls, or pillars of ore. Such a method is limited to orebodies with strong walls and ore strong enough to stand unsupported (or nearly so) over the back of the stope.[2]

Filled Stopes

In orebodies where the ore itself and the surrounding country are not sufficiently firm to stand, either alone or aided by some manner of support used in open-stope methods, then, if surface subsidence and underground caving are to be avoided, waste filling must be added as the work of extraction progresses. The result is then known as a *filled stope.*

Filled stopes may or may not contain timber. The filled stope which contains the largest quantity of timber is the square-set stope, where the timbers are used temporarily to support the back, and thus protect the men while the ore is being extracted and waste rock, or sand filling, put in to take its place. A lesser amount of timber is used in the cut-and-fill method, where only one line of square sets is carried up for chute and manway purposes, and occasional stulls are used under boulders, and lagging is used on the sides.

Caved Stopes

A caved stope has no waste fill; neither is any form of support used. But, as mining progresses, the back, or capping, is broken and brought down following the extraction of the ore, the rate of settlement being governed by the rapidity of the ore extraction. Most caved stopes contain very little timber, the caved stope in which a large amount of timber is used being the top-slice.

Open stopes are principally applicable to hard-rock mines; *filled stopes* to medium and soft ground of high grade; and *caved stopes* are mainly used in medium and soft ground of low value and large extent. All ore is extracted from one of these types of excavations. In fact, there is no stope which does not come under one of these headings. A stope can either be open, filled with waste, or allowed to cave.

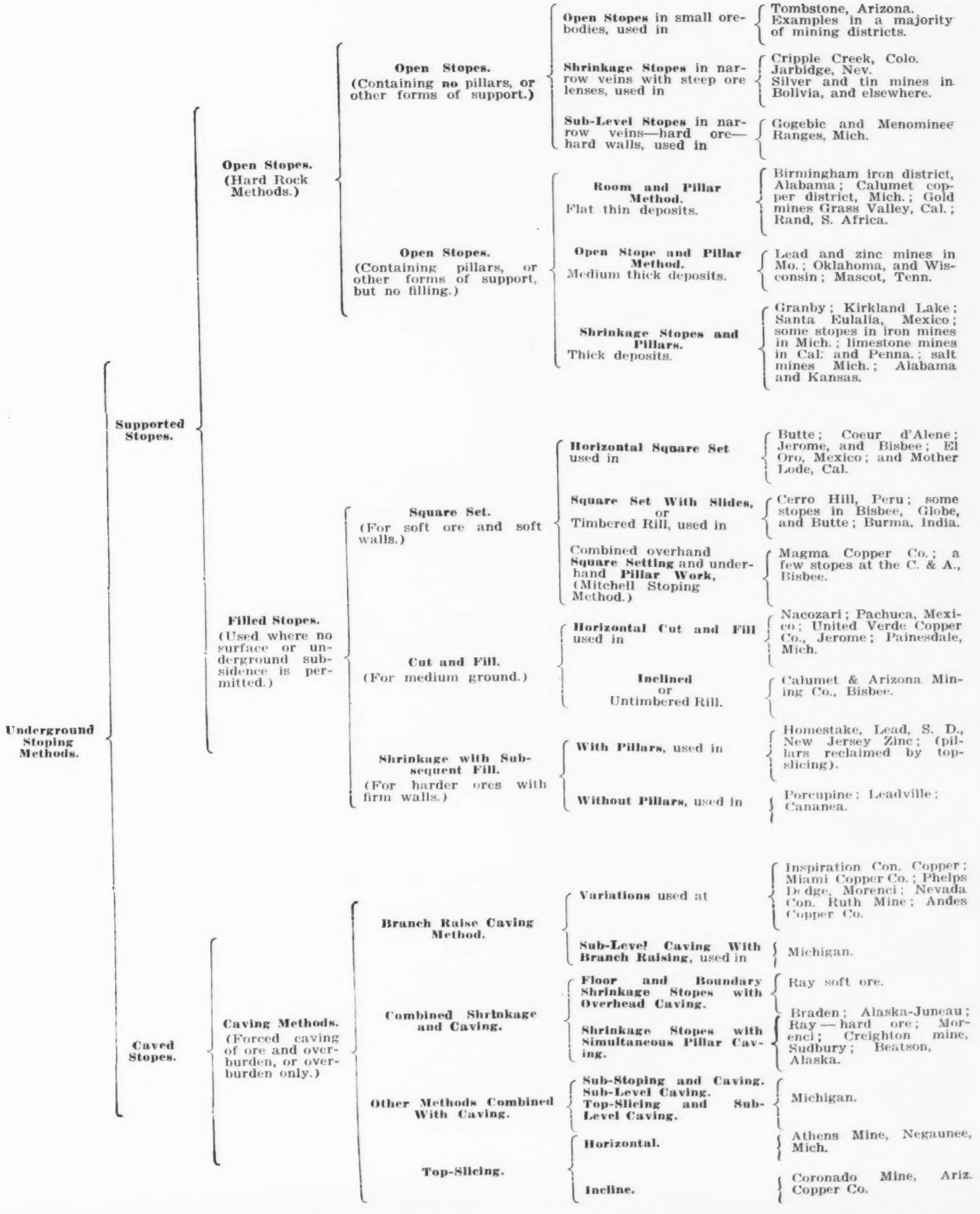
The development of the classification thus far is as follows:

- **Underground Stoping Methods**
  - **Supported Stopes**
    - **Open Stopes**
      - Stopes which stand without artificial support.
      - Stopes requiring rock walls, pillars of ore, or occasional stulls.
    - **Filled Stopes**
      - Stopes using sand, rock, or tailings for fill.
  - **Caved Stopes**

[2]Trans. A.I.M.E., Vol. LXXII, p. 146.

Classification of Modern Stoping Methods

FIG. 1


Underground Stoping Methods.
Supported Stopes.
Open Stopes. (Hard Rock Methods.)
Open Stopes. (Containing no pillars, or other forms of support.)
Open Stopes in small ore-bodies, used in
Tombstone, Arizona. Examples in a majority of mining districts.
Shrinkage Stopes in narrow veins with steep ore lenses, used in
Cripple Creek, Colo. Jarbidge, Nev. Silver and tin mines in Bolivia, and elsewhere.
Sub-Level Stopes in narrow veins—hard ore—hard walls, used in
Gogebic and Menominee Ranges, Mich.
Open Stopes. (Containing pillars, or other forms of support, but no filling.)
Room and Pillar Method. Flat thin deposits.
Birmingham iron district, Alabama; Calumet copper district, Mich.; Gold mines Grass Valley, Cal.; Rand, S. Africa.
Open Stope and Pillar Method. Medium thick deposits.
Lead and zinc mines in Mo.; Oklahoma, and Wisconsin; Mascot, Tenn.
Shrinkage Stopes and Pillars. Thick deposits.
Granby; Kirkland Lake; Santa Eulalia, Mexico; some stopes in iron mines in Mich.; limestone mines in Cal: and Penna.; salt mines Mich.; Alabama and Kansas.
Filled Stopes. (Used where no surface or underground subsidence is permitted.)
Square Set. (For soft ore and soft walls.)
Horizontal Square Set used in
Butte; Coeur d'Alene; Jerome, and Bisbee; El Oro, Mexico; and Mother Lode, Cal.
Square Set With Slides, or Timbered Rill, used in
Cerro Hill, Peru; some stopes in Bisbee, Globe, and Butte; Burma, India.
Combined overhand Square Setting and underhand Pillar Work, (Mitchell Stoping Method.)
Magma Copper Co.; a few stopes at the C. & A., Bisbee.
Cut and Fill. (For medium ground.)
Horizontal Cut and Fill used in
Nacozari; Pachuca, Mexico; United Verde Copper Co., Jerome; Painesdale, Mich.
Inclined or Untimbered Rill.
Calumet & Arizona Mining Co., Bisbee.
Shrinkage with Subsequent Fill. (For harder ores with firm walls.)
With Pillars, used in
Homestake, Lead, S. D., New Jersey Zinc; (pillars reclaimed by top-slicing).
Without Pillars, used in
Porcupine; Leadville; Cananea.
Caved Stopes.
Caving Methods. (Forced caving of ore and overburden, or overburden only.)
Branch Raise Caving Method.
Variations used at
Inspiration Con. Copper; Miami Copper Co.; Phelps Dodge, Morenci; Nevada Con. Ruth Mine; Andes Copper Co.
Sub-Level Caving With Branch Raising, used in
Michigan.
Combined Shrinkage and Caving.
Floor and Boundary Shrinkage Stopes with Overhead Caving.
Ray soft ore.
Shrinkage Stopes with Simultaneous Pillar Caving.
Braden; Alaska-Juneau; Ray — hard ore; Morenci; Creighton mine, Sudbury; Beatson, Alaska.
Other Methods Combined With Caving.
Sub-Stoping and Caving. Sub-Level Caving. Top-Slicing and Sub-Level Caving.
Michigan.
Top-Slicing.
Horizontal.
Athens Mine, Negaunee, Mich.
Incline.
Coronado Mine, Ariz. Copper Co.

No two orebodies are identical. They differ in size, shape, position, depth from surface, grade, texture of rock, mode of occurrence, and surrounding rocks. These differences have given rise to a number of variations in the above-mentioned methods of ore extraction, which are shown in Fig. 1—a further extension of the former classification. The object of this classification is to present an outline of the more important methods in the simplest and most direct manner.

Open-stope methods may be divided into *open stopes without pillars* and *open stopes with pillars*. These are methods for use in hard ore, with hard walls.

Open stopes without pillars are used in small, scattered orebodies, narrow veins with steep ore lenses, and medium-thick veins, all with hard walls and hard ore, which stand well. There is a great variation in the manner of mining these deposits. Small orebodies may even be gophered out, or mined with small shrinkage stopes, perhaps benched in certain cases, whereas the extremely hard ore, with exceptionally firm walls, can be mined to advantage by the sublevel stoping method, as practiced on the Gogebic range.

Open stopes with pillars are applicable to very low-grade, flat, thin deposits, such as the Birmingham iron and Calumet copper deposits and some of the gold mines on the Rand in South Africa. In these mines the ore occurs in thin sheets, miles in extent, ranging from 7 to 10 ft. in thickness at Birmingham (with one exceptional case of 18 ft. in thickness) to 10 to 18 ft. at the Calumet copper mines and 2½ to 6 ft. on the Rand.

At Birmingham and Calumet the scraper is used to a considerable extent to facilitate the handling of ore. In the medium-thick deposits, such as the lead-zinc districts of Missouri, Oklahoma, and Wisconsin, where there are many isolated orebodies, which may or may not be connected, and where the thickness may be anywhere from 15 to 30 ft., irregular pillars are left wherever necessary and mechanical shovels are used to a large extent. The ore may be broken down by benching or by stoping upward, and where the beds are thin the ore is stoped by silling out, or driving, large drifts. At Mascot, mill holing, with pillars, is used, and at Mount Hope a form of shrinkage is practiced.

The open stope and pillar method as applied to thick deposits is illustrated by the method used in some of the larger orebodies at Granby, the lead replacement deposits at Santa Eulalia, Mexico, as well as some of the larger iron orebodies in northern Michigan, and limestone mines in Pennsylvania.

For high-grade orebodies with walls that will not stand unsupported, or that are supported by means employed in open-stope methods, and where no surface or underground subsidence is permitted, *filled stope methods* are used.

The *square-set* is particularly applicable to soft ore, and soft walls, and the *cut-and-fill* method is used where the walls are firmer than in the square-sets, and the ore will stand with very little timber support, so that a man can work beneath it with safety. In the *shrinkage-with-fill*, the walls and the back must be firm enough to stand until all the ore is drawn out and waste fill can be added.

The *caving systems* are applicable to very low-grade, massive deposits, with considerable vertical height. Height is necessary in order that the ore may run by gravity into the chutes, and thus eliminate hand shoveling. The top-slice is the highest-cost caving method, and is applicable to medium or high-grade orebodies, in ground that is soft, with a capping that follows readily. This system may be used to good advantage in either thin or thick deposits.

Reasons for Suggested Classification

In this outline it will be noted that methods have been classified according to the natural action of the ground when ore is being extracted. Methods were originally worked out to suit the different classes of ground, rather than the ground being adapted to suit the methods. Therefore, the basic principle underlying all stoping methods is the character of the ground in its natural state, and the resulting set of local conditions caused by the extraction of ore.

Though this classification of stoping methods is based primarily on the behavior of the ground, the selection of a stoping method for a particular orebody must take into consideration the grade of the ore as well as a number of other factors. A classification of methods, however, according to grade, would be entirely too general, as the only practical division that could be made would be between "high grade" and "low grade"; this would be further complicated by the fact that, depending on the behavior of the ground, a low-grade method is sometimes applied to a high-grade orebody, and vice versa.

In some classifications, stopes have been grouped under the terms "timbered stopes" and "untimbered stopes"; but, in this outline, such titles have been subordinated, as they are not sufficiently descriptive. A large number of stoping methods require timber, but the timber is supplementary to the method used, and two entirely different methods of ore extraction may both use equal quantities of timber. For example, practically the same amount of timber is used in square-setting as in top-slicing, yet the square-set is a filled method, while top-slicing is not only *not* a filled method but belongs under the classification of "caved stopes." In the former the entire ground mass is kept intact, by means of waste fill, whereas in the latter the country is caved and the capping drawn down over the top-slice.

The terms "underhand" and "overhand" have been omitted from this classification, as they appear to be qualifying terms rather than methods, and merely indicate the direction in which the work of extraction progresses —that is, "down" or "up." An estimate of the tonnage of ore stoped upward and downward shows that practically 95 per cent is obtained from methods that progress upward or "overhand," and only about 5 per cent comes from those that progress downward, or "underhand." Moreover, if these two terms are used as major divisions of stoping, several totally different methods can be classified under each, and merely to state that a property is being mined by the "overhand" method gives no information unless the exact name of the method—"square-set," "cut-and-fill," "shrinkage," and so forth—is added. These are, however, convenient terms when applied to square-setting, which is practically the one method that can be carried either upward or downward. Milling is one of the very few methods carried on "underhand," but has a limited application, as there are very few mines in which the rock is firm enough to permit the use of this method. Room-and-pillar, or open stope and pillar methods are occasionally carried downward, but when this is done the method resolves itself into an underground mill hole, which is really a form of benching the ore downward. Square-setting is occasionally carried downward in caved or very loose ground, to avoid spiling,

which would be necessary if the stope were carried upward, but in general it is far cheaper to carry the square-sets upward.

Though top-slicing may be considered by some as an "underhand" method, the dominant feature of the method is the *caving of the back*. If it is to be considered an "underhand" method, arguments might, with equal justice, be advanced that it should be classified as a "timbered method," but of the three important details of the method—that is to say the direction in which the stope is carried, the use of timber, and the caving of the back—the most important is the last, because it is the feature which distinguishes top-slicing from all other "underhand" and "timbered" methods. Top-slicing is certainly not a supported method, because the timbers are blasted as the work of extraction progresses; neither is it a filled method, for no extraneous filling is used. The timbers merely support the ground temporarily for reasons of safety until the ore is taken out, when, having served their purpose, they are blasted and mix with the waste rock which caves from above.

The variations of shrinkage stoping, depending on ground characteristics, place it under the classification of both "open," "filled," and "caved" stopes. If the walls of the orebody in the shrinkage stope are not sufficiently firm to stand indefinitely, and it is necessary to keep the surrounding country intact, filling is used. On the other hand, if they are strong enough to stand unsupported, the stope is left standing open. "Shrinkage," which caves the capping, is classified as a "caved-stope method."

In this classification the term "block-caving" has not been applied to any particular variation, for the reason that all caving is really *block-caving*. The block may approximate a square, or it may more nearly resemble a rectangle, being considerably longer than it is wide, but in each case it is a block of ore that is caved. The term is, therefore, considered too general to be applied to any subdivision.

Where the room-and-pillar method is used, the room ore being extracted by one method and the pillar ore reclaimed at a later date, by some other method, such an arrangement requires two separate mining operations. For the purpose of this classification the method has not been considered as a combined one. For example, in many orebodies, where shrinkage and fill has been used, the pillars were extracted later by either square-setting or top-slicing.

Gold Being Coined, But Not for General Circulation

ABOUT $20,000,000 worth of $20 gold pieces is to be coined in the San Francisco mint, and, in the aggregate, the three United States mints will in the next few months coin gold to the amount of $100,000,000. None of these coins are for general circulation. They are to be used as a reserve to back up gold certificates. Not only has gold disappeared from general circulation but silver dollars have also greatly diminished in number.

R. G. Grant, director of the Mint, recently said: "Nowadays the greater part of the public objects to gold coin because of its weight; the government objects to it because of the ease with which its value can be decreased by the criminally minded, when it is in general circulation. Sweating, abrasion, and boring are methods used to pilfer a dollar or so from $20 gold pieces, and such practices reached a stage where banks were weighing the coins when they totaled any considerable sum and deducting the missing gold when the depositor was credited."

Although the United States has more than half the total world's gold supply, most of it is stored in the three mints and in New York. The United States uses annually about $65,000,000 worth of gold in the arts, and of this $6,000,000 to $7,000,000 is regained in the form of old gold. The last-named figures are probably representative of the amount of old gold reclaimed for monetary purposes, as in 1925, $29,792,021 worth of old gold material was reclaimed, of which a considerable part was returned for use in the arts. Of the total gold, $65,953,870, used in the arts in 1925, only $36,161,849 worth was derived from bullion and foreign coins. This would indicate that present United States gold production, around $50,000,000 per year, is in excess of this demand. Nevertheless, it indicates that there is a large inflow of gold which remains in the hands of the people.

Natives washing for tin with Klondike rockers, and "batea." State of Guanajuato, Mexico.

Giant Rolls—A Phase in the Development of Primary Breakers

By W. T. W. MILLER

Engineer in Charge, Crushing Machinery Department
Hadfields Limited, Sheffield, England

GIANT ROLLS of large diameter and great width of face form a class by themselves among the various machines used for coarse crushing. They are a product of the genius of Thomas A. Edison and may be counted among his many remarkable inventions. About 1894 Mr. Edison realized that the operations of secondary blasting and hand sledging, to reduce the stone or ore to such sizes as could be handled by the primary crushers then in general use, formed a high proportion of the total cost of production, and he therefore set to work to design a machine which would minimize these charges. At that date the large jaw and gyratory crushers were still in their infancy and the steam shovel had not yet been generally introduced for mine and quarry work.

Mr. Edison's solution of the problem was a crusher consisting of a pair of large rolls, the crushing surfaces being made in the form of a series of plates covered with knobs or projections to assist in breaking up the material. The original machine was patented in 1895, and, in the mill first constructed, the rolls were 6 ft. diameter by 5 ft. long. This set of rolls would crush larger pieces than the jaw breakers which were then available, but when an extra large stone was dumped into the hopper it would ride about instead of being gripped and would either wear away the teeth very rapidly or tear the plates from the surfaces of the rolls. To overcome this, two rows of knobs set diametrically opposite were lengthened to project about 2 in. above the normal teeth on one of the rolls. These "slugger" teeth were so placed with the object of striking heavy blows on the larger pieces of rock, breaking them down to a size within the angle of nip of the rolls. It was then found that the "slugger" action increased the rate of crushing to such an extent that the power was insufficient to prevent the machine from choking and pulling up when a full wagon of stone was unloaded into the hopper. This tendency to "stall" was removed when the rolls were run at a much higher speed than when first erected. The increased momentum of the large masses created a large reserve of kinetic energy which was sufficient to overcome any peak loads due to large stones or flooding. The increased speed also added considerably to the power and number of the blows delivered by the "slugger" teeth and the stones were driven against the sides of the hopper and shattered as on an anvil plate. The rapid reduction of the large lumps prevented stones from riding for any length of time on the tops of the teeth, and the life of the roll-plates was greatly increased. With the exception of slight changes in details and some increase in dimensions, the machine as developed during these experiments has remained unaltered in all essentials. Mr. Edison adopted the same principle of high-speed rolls for secondary crushing, but these machines were not so successful as the giant rolls, and the follow-

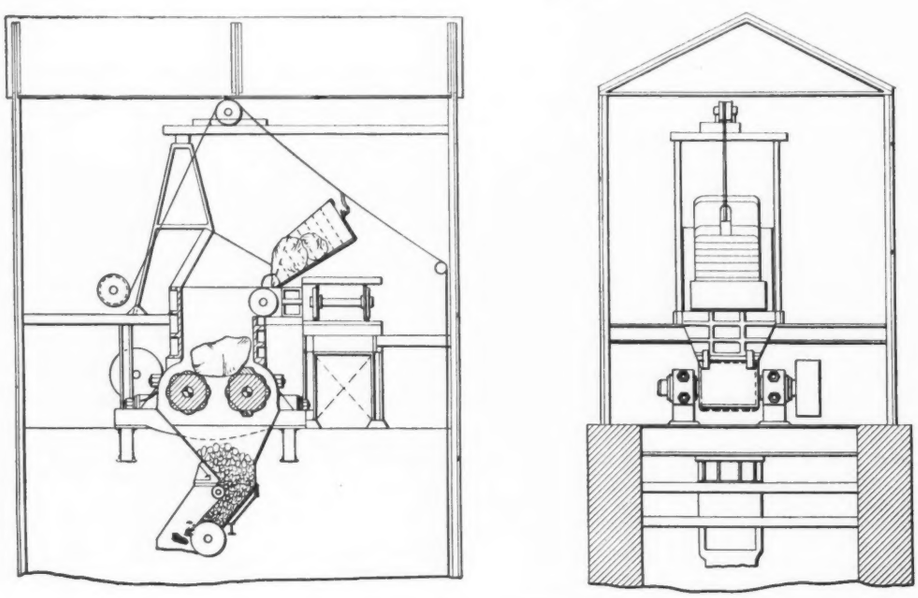


Fig. 1—At the plant of the Edison Portland Cement Co. the primary rolls were so arranged that the stones fed to them fell from a height of 10 ft. or more.

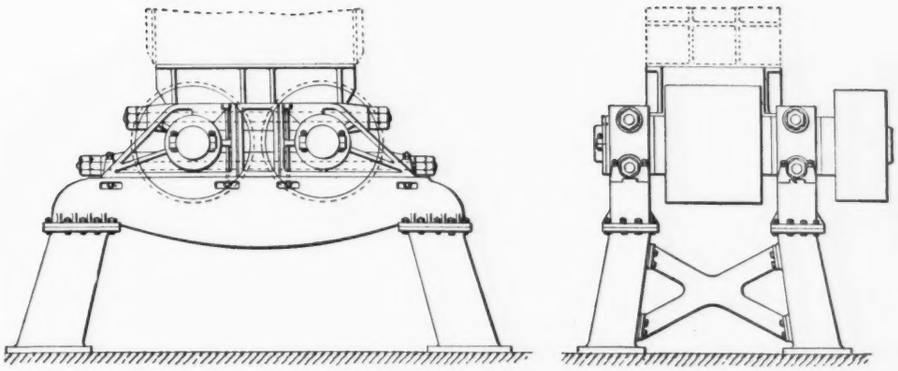


Fig. 2—A set of rolls, 6 ft. in diameter by 5 ft. wide, erected about 1907 at the plant of the Church Quarry Co. at Sibley, Mich.

ing remarks have reference to the earlier type particularly.

Rolls 6 ft. in diameter by 7 ft. long are installed in a number of plants, the normal speed varying from 175 to 200 r.p.m., giving a circumferential speed of roughly 3,500 ft. per minute. At this velocity the capacity of the rolls is enormous; in fact, the Kelly Island Lime Co., dealing with dolomite rock in pieces up to 4 or 5 tons' weight, crushed 35 tons in 32 seconds, or at the rate of 4,000 tons per hour.

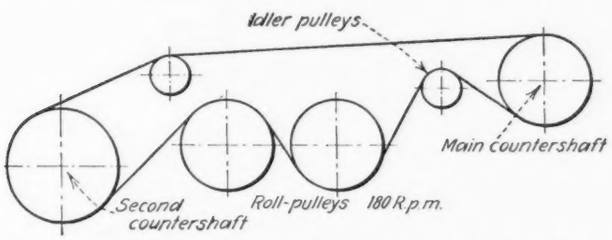


Fig. 3—Diagram showing arrangement of single belt used to drive the rolls shown in Fig. 2.

It should be explained that the rolls cannot maintain the output at the rate indicated. The prime mover used for driving must be kept within economical limits and is unequal to the abrupt demand for excessive power. The sudden call on the flywheel energy pulls the speed down so that, if the feed were maintained, the rolls would ultimately be brought to a standstill.

Such time as is occupied in changing and dumping the cars is usually sufficient to allow the rolls to regain their momentum, but this spasmodic or intermittent crushing at a high maximum rate makes it necessary to provide a storage hopper under the rolls so that the distribution of the crushed stone to the secondary machines may be regulated by means of a feed roller or other similar device.

Fig. 1 illustrates the arrangement of the primary rolls in the plant of the Edison Portland Cement Co. It will be seen that the stones were made to fall from a considerable height on to the rolls. The deep hopper served a double purpose: it formed a chamber in which the larger blocks were beaten about by the "slugger" roll until they could be seized by the toothed surfaces, and the drop of 10 ft. or more was sufficient to shatter some of the stones by impact.

It is a surprising fact that the shocks caused by such heavy masses of rock striking the rolls had little or no effect on the shafts and bearings. They would seem to be absorbed almost entirely in the mass of the rolls.

The surge bin under the crusher is a noticeable feature and, as previously stated, is a most necessary part of all installations embodying a machine of this type.

Fig. 2 shows a set of rolls, 6 ft. diameter by 5 ft. wide, supplied about 1907 and erected at the plant of the Church Quarry Co., Sibley, Mich. The cast-iron standards, with spandrel braces, used for supporting the two main girders or bedplates, were a distinctive feature of the early designs for these roll crushers. This pair of rolls were driven by a single belt arranged as indicated in Fig. 3. The roll pulleys were slightly less than 6 ft. diameter, to allow the belt to pass between them, and a large flywheel was used as the driver, the same belt transmitting power to a countershaft on the opposite side of the mill.

The pulleys were lagged with wood, but the drive was extremely complicated and, since the belt was flexed in both directions and subjected to wear on both sides under heavy intermittent loading, it could hardly be expected to give a long life. This system of driving both rolls by the same belt was adopted in most of the steam-driven plants, but, where electric power was available, separate motors were applied to the two rolls and straight belts were admissible.

In the giant rolls each roll consists of a center comprising three rings or sections pressed on the shaft to form a solid core with an octagonal outer surface, the

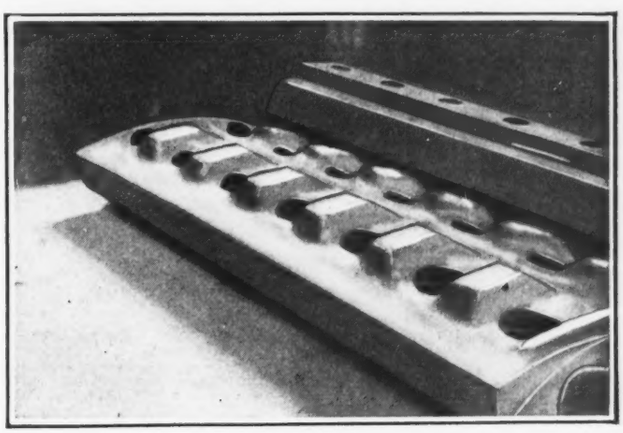


Fig. 4—One of the eight renewable chilled iron plates which include the toothed or crushing surfaces of the giant rolls. Note the formation of the teeth on the chilled surface of the plate.

flat faces being prepared to receive the eight renewable chilled-iron plates which include the toothed or crushing surfaces. Each plate is secured by two rows of screws, the heads being sunk in recesses in the casting

and locked by special means. A tongue on the machined undersurface of the plate registers in a keyway running the full length of the flat on the center. Fig. 4 illustrates the formation of the teeth on the plate.

The roll shaft is supported in two bearing blocks of the type shown in Fig. 5, the bearing proper consisting of a circular flanged bush made of cast iron lined with babbitt metal and with a small snug or feather key on its outer circumference to prevent the bush from turning.

All of the four bearings rest on two heavy cast iron "fishback" girders, and the upper faces of these bedplates are machined with continuous tongues which fit into planed recesses in the housings for the bearings. The blocks are clamped to the girders by bolts sliding in tee-grooves, and those supporting the shaft carrying the "slugger" roll are secured by cross keys to make them rigid, one roll with its bearings being free to slide to permit the centers to be changed in order to vary the size of the finished product.

The two blocks on each side frame are tied together by through bolts above and below the shafts. In the 6 x 5-ft. rolls at Church Quarry these bolts were 6 in. in diameter. A packing block partly fills the space between the bearings and strips of wood are inserted to make up the distance to the required dimension, the rolls being usually set to reduce the rock to 6 in. or up to 10 in. product.

The shafts in the largest rolls are about 20 in. in diameter in the center and 18 in. in diameter at the journals. Maximum weight of each roll and shaft will reach 37 to 40 tons, and it is obvious that this great weight, combined with the high surface speed of the shafts, made it necessary to provide copious lubrication. All these machines are lubricated by force pump through an elaborate system of supply and collecting pipes, and great care must be exercised to avoid even a momentary cessation in the flow of the oil. Several sets of these rolls measuring 6 ft. in diameter by 7 ft. wide have been put into service in the United States, where they are mostly used for crushing limestone. Probably the largest assemblage of machines of this type was made a number of years ago at the Dunderland iron mines, in Norway, comprising two sets of coarse rolls 7 ft. in diameter by 7 ft. wide and six sets of secondary rolls 5 ft. diameter by 3 ft. wide, but this plant closed after a brief life.

It is difficult to give exact figures as to the power required to drive these rolls. When the mill is electrically driven it is usual to install a motor of higher power for the "slugger" roll than for the normal roll. In one plant which I inspected the 6 x 7-ft. rolls were driven by motors of 200 and 250 hp., and these were frequently subjected to severe overloads, although the total average consumption for the two rolls did not exceed 185 b.hp.

In practically every case the rolls have to be barred round before they will start, the effort required being greatest in cold weather. The large rolls at Dunderland had a separate barring engine with worm reduction gear fitted to each roll shaft, but this was unusual. A long lever, made from a piece of flat-bottomed rail, with plenty of man-power at the end, is generally used.

The life of the roll plates varies considerably with the character of the rock which is being crushed. Chilled iron of the highest quality has proved the most suitable material for these plates. They have to be accurately machined on their under surfaces, and the splines must fit correctly; otherwise the sections will quickly shake loose. Manganese steel has been tried, but the plates tend to distort and peen over under the hammering.

The "slugger" plates naturally give out before those with the smaller teeth, but, assuming that they do not fail by breaking, these plates should last for about one year's work on a moderately hard limestone. When crushing a tough or abrasive rock or ore, the wear is much more rapid, and it is questionable whether a machine of this type is suited for work of this kind.

It is difficult to compare the character of the finished product from these high-speed rolls with that made by either jaw or gyratory crushers. The rapid hammering from the teeth of the rolls, combined with the shattering action of the "slugger" knobs, would appear on first consideration to make certain a relatively high proportion of fines. Users state, however, that on a compact limestone the resulting product is very similar to that made by the reciprocating machines, and it would seem that the rapidity of the crushing action is, in a measure, responsible for this, as the material moves so quickly that choking and fracture by mastication are impossible.

The great advances made in the size of both jaw and gyratory crushers have relegated the giant rolls to the background among primary breakers, but no record of crushing machinery would be complete without mention of the outstanding part they have played in the industry. Apart from the wear and tear when crushing any hard stone, their chief disadvantage would appear to be an excessively high but spasmodic rate of discharge and a correspondingly great fluctuation in the demand for power. As the size of a sledging crusher is usually determined by the feed opening required to take the largest lumps, the maximum output is frequently considerably in excess of the average requirements, even with reciprocating breakers, and this discrepancy is decidedly over-emphasized when giant rolls are used.

The life of the wearing parts, when compared with those in either jaw or gyratory crushers, would generally be much shorter, and the last-named machines give a more even rate of discharge with a more regular call on the power line.

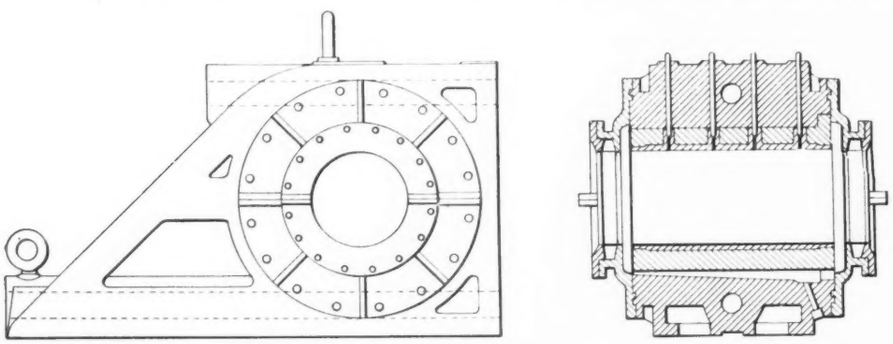


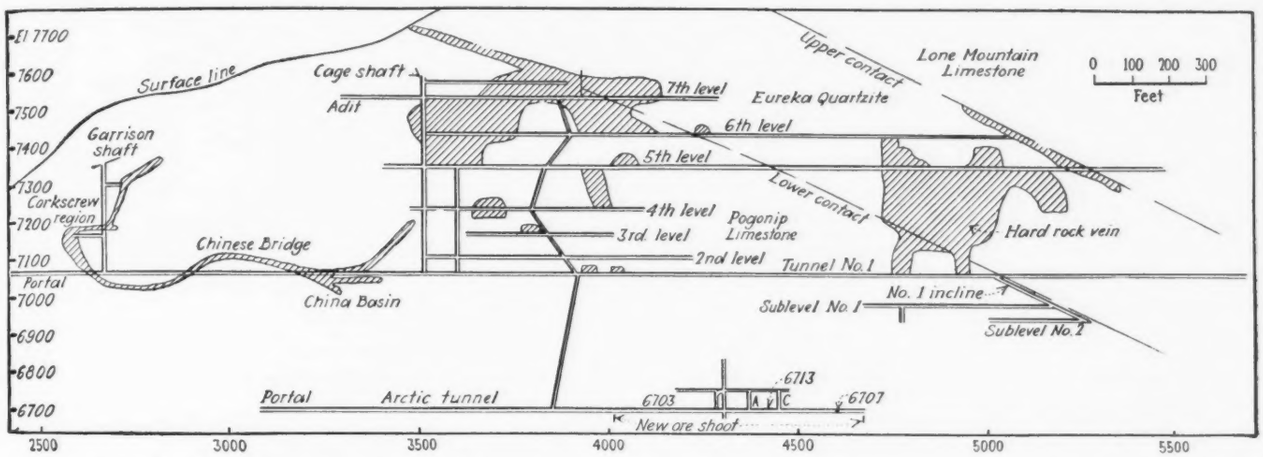
Fig. 5—One of the two bearing blocks that support the roll shaft of the set of rolls shown in Fig. 2.

The Cortez District Rejuvenated

By J. O. GREENAN

General Superintendent, Consolidated Cortez Silver Mines Co., Cortez, Nev.

PROSPECTORS working northward in the late '50s or early '60s from the new camp of Austin, in Nevada, found Indians gathering galena float in certain gulches at the southern end of the Cortez Mountains. Inspection of the cliffs above resulted in the discovery of the St. Louis lode, which for years produced a moderate tonnage of high-grade silver-lead ore. Many locations were made in 1863, under the local laws of the Cortez mining district, laws which apparently allowed each locator 200 ft. along the lode. An eight-stamp mill was built in Mill Canyon in 1864, and five stamps and four roasting furnaces were added later. This plant was acquired in 1869 by Simeon Wenban, who had been one of the first to arrive in the new camp. Wenban gradually obtained control, by location and purchase, of a large group of the most important claims, and proceeded to work them.



Vertical projection of workings of Consolidated Cortez Silver Mines Co., showing general relation between stoped orebodies and recently discovered orebody in Arctic Tunnel

Wenban's records and letters, beginning in 1867, have been preserved and form an interesting document. In one of his first letters he mentions rather doubtfully the plans of the Central Pacific Railroad to have track laid through this portion of Nevada in 1869. Mining costs in the late '60s appear to have averaged about $10 per ton; packing four miles by mules cost $5, and milling cost $20. These staggering figures were offset by the high grade of the ore and the prevailing price of about $1.29 per ounce for silver. In spite of the proximity of the mill, many shipments were made to Austin, 60 miles away. Wenban mentions that $200 ore was needed for his Austin shipments.

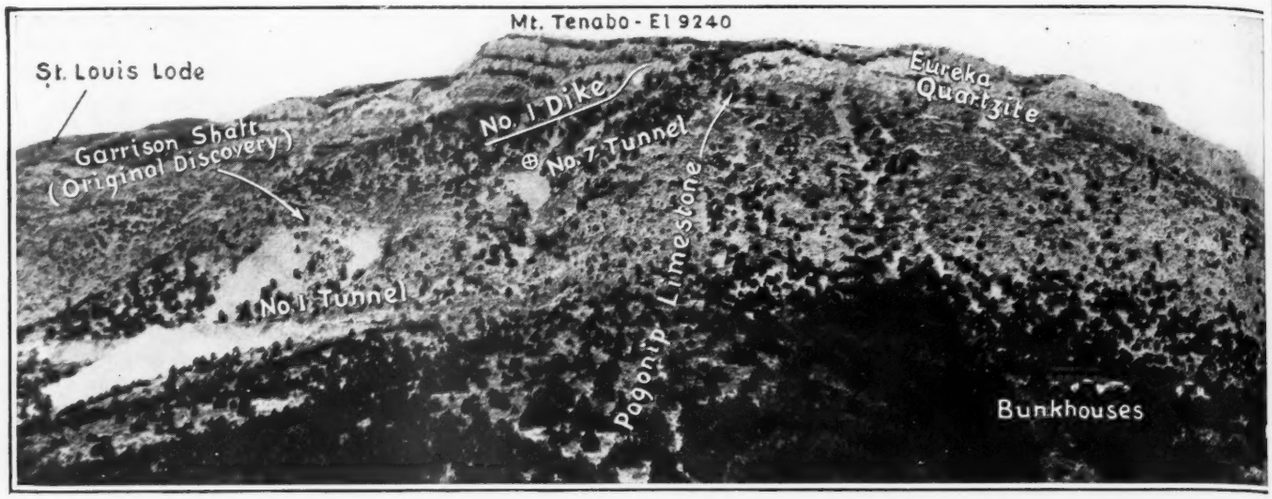
Until 1886 Wenban operated the Mill Canyon mill during the summers only, retaining a small mine crew in the winter time. In 1871 labor difficulties had caused him to begin using Chinese labor, paying $40 per month of twenty-six days of ten hours each, the Chinese furnishing their own board. In 1886 a new mill was completed near the Garrison mine, in the present town of Cortez. This mill was a model in its day. The process used involved a chloridizing roast, followed by leaching with sodium hyposulphite, with an extraction of 85 to 90 per cent of the silver. It was operated practically without a shutdown from 1886 to 1892, and from 1896 to 1903, on a basis of about 25 tons per day. Records show a production of about $10,000,000 to 1903, although this does not include many unrecorded shipments.

After Wenban's death, in 1895, his heirs continued operations until 1903. Beginning in 1908, Geiger cyanided approximately 120,000 tons of tailings, but no serious work was resumed until 1920, when the Consolidated Cortez Silver Mines Co. purchased the property and initiated development work. A concentrating and cyaniding plant started milling in June, 1923, and has milled 100 to 150 tons per day ever since.

Cortez today is a small community on the line between Eureka and Lander Counties, Nevada, about 36 miles south of Beowawe, on the Southern and Western Pacific railroads. The name of Cortez was originally applied to the settlement at the thirteen-stamp mill in Mill Canyon, 4 miles further north.

GEOLOGY

The southerly end of the Cortez Mountains is conspicuously marked by a nearly cross-sectional exposure of a 300-ft. bed of Eureka quartzite, overlaid by a few hundred feet of Lone Mountain limestone and underlaid by a known thickness of more than 2,000 ft. of Pogonip limestone. These correlations are tentative but are probably correct. Field relations indicate that the lower



Panorama of Mount Tenabo district, showing

limestone rests on a large granitic mass. All three sedimentary formations are massive, although thin bedding is occasionally seen, particularly in the upper limestone.

The quartzite and limestone beds dip conformably about 23 deg. S. 80 deg. E., and are cut by a series of eight highly altered porphyry dikes, which strike S. 80 deg. E., and dip about 75 deg. North. Only one of these, No. 1 dike fissure, has been thoroughly explored, although all of them seem worthy of prospecting. It is clear that the dike material at no time entirely filled the fissure into which it was injected or which it helped create. The fissure is filled in large part by altered porphyry and by a brecciated and recemented limestone-calcite aggregate. Both of these have been replaced by silver-bearing quartz, with galena, pyrite, tetrahedrite, sphalerite and chalcopyrite, with their oxidation products, thus forming large bodies of ore along the dike fissure. The largest of these have been found in the lower limestone, although the quartzite has been very productive, and the overlying limestone but slightly so. This may be due to the fact that the upper formations have not been prospected as thoroughly as the lower.

The orebodies may be classified as follows:

1. Orebodies formed along No. 1 dike fissure, in lower limestone, quartzite and upper limestone.
2. Orebodies formed along upper or lower quartzite.
3. Orebodies formed, principally in the lower limestone, in the footwall of No. 1 dike, as tabular veins, or as irregular pipes or ribbons.

Field relations indicate that the dikes were injected from below, following but not completely filling zones of weakness in the three formations. Ascending solutions replaced large portions of the resulting mass along the dike fissure (or fissures) with silver-bearing quartz. They spread out along both upper and lower quartzite contacts, forming umbrella-like masses of ore radiating from the dike fissure. They also followed fractures and cavities in the limestones, and to a less extent in the quartzite, forming tabular veins as well as highly irregular but rich orebodies, extending several hundred feet into the footwall of the dike fissure. Local evidences of secondary enrichment can be found, but the ore is unquestionably primary. The deposits fall quite definitely into the cryptobatholithic classification of W. H. Emmons, in a local sense, but, from an areal standpoint, they are acrobatholithic.

Ore was first found near the Garrison shaft, in the footwall of No. 1 dike. It was a pipe of rich, argentiferous galena, sometimes spreading out into tabular form, which wound its way down through the "Corkscrew Region" to a depth of about 300 ft., then flattened easterly through the "China Basin" and "Chinese Bridge." Finally, through the "Hog Trail" and "Red Breast" veins, the old workers were led north to the orebodies along the dike fissure. Extensive lateral prospecting followed, until at present the workings total 25 to 30 miles in length.

Stoping was done at intervals along the dike from No. 1 adit level to surface, 630 ft. above, but the largest stopes were between the fifth and seventh levels, 100 to 300 ft. below surface. The largest of these was 630 ft. long, 5 to 15 ft. wide, with a maximum vertical extent of 220 ft. along the vein. The areas stoped became smaller with depth, until at Level No. 1 there was little ore along the dike. Likewise, the richer, footwall orebodies became unprofitable at about that level.

It seemed, then, that a lean zone had been encountered and that the mine's salvation depended on the finding of ore below this zone. Wenban had, many years ago, started the Arctic Tunnel, a crosscut 360 ft. vertically below No. 1 level. After the present operators assumed control, in 1920, this tunnel was advanced to its present length of 2,569 ft., cutting the No. 1 dike fissure, along which a raise was driven to serve as an orepass. A 677-ft. drift along the fissure developed 200 ft. of 15-oz. ore, of an average width of 5.5 ft., but raises passed into waste a few feet above the drift.

New Ore Recently Found

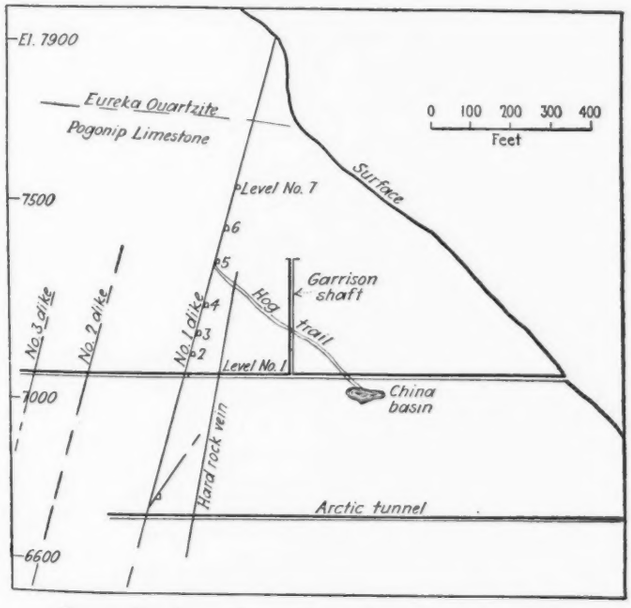
However, recent work has established the existence of important orebodies which follow fractures leading into the footwall from the dike fissure, and has also established the upward continuance of the previously exposed orebody, which flattens into the footwall a short distance above the Arctic level. Since their discovery, in October, 1926, these orebodies have produced about 10,000 tons of 31-oz. ore, of which about 7,500 tons came from development. The oreshoot is now developed by drifts for a total length of 710 ft., of which a gap of 100 ft. remains to be closed. Raises have shown its persistence for at least 160 ft. along the dip of the vein, which projects upward to an unprospected region at the level

position of Cortez mine workings and mill.

of No. 1 tunnel. Lateral work, several raises, and a winze are being advanced in ore; the orebody is thus rapidly assuming important dimensions, and profitable operations for an indefinite period seem assured.

Concentrate shipments from the Arctic orebodies show an increase in the percentage of copper and zinc, which is substantiated by the visible increase in the amount of tetrahedrite and sphalerite. As an "indicator" of high silver content, galena has given way to gray copper.

In this connection it should be remembered that the Arctic level is approximately 1,000 ft. below the highest point on surface from which ore has been extracted and that the Arctic orebodies are approximately 1,600 ft. vertically under surface. As mentioned before, it is possible that the raises now being advanced from the Arctic level will disprove the "lean zone" theory, as



Generalized north-south section of Cortez mine

the new orebodies may extend upward to the level of No. 1 tunnel.

A study of the relative amounts of the metals produced in the form of concentrate yields strong evidence that the zonal theory of vertical deposition is well illustrated in this mine, as shown by the accompanying table.

Metals Produced Per Ton of Ore

	Oz.	Per Cent				
	Silver	Lead	Zinc	Copper	Iron	Sulphur
Ore from upper levels, 100 to 300 ft. depth	11.0	0.06	0.04	0.004	0.24	0.03
Ore from Arctic level 1,000 to 1,600 ft. depth	31.0	0.51	0.69	0.063	1.18	0.50
Ratio, Arctic level to upper levels	2.8/1	9/1	17/1	16/1	5/1	20/1

This ratio is undoubtedly overemphasized by the fact that the Arctic ore has been much cleaner than the ore from the upper levels. However, the relatively great increase in the proportion of copper and zinc is apparent.

The low sulphur content is surprising, in contrast with the metallic content, and indicates a higher proportion of oxidation products than would be expected from visual inspection of the ore.

Mining

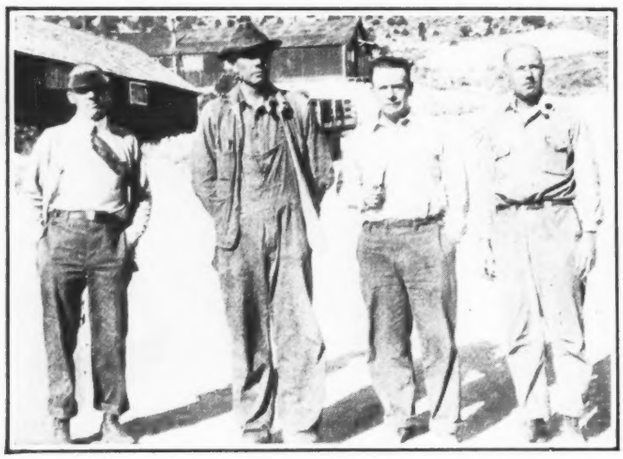
An 800-ft. raise has greatly facilitated handling of the ore from the upper levels to the Arctic Tunnel, from which is is hauled in 18-ton mule trains to the head of the mill. About 140,000 tons has been milled since 1923, of which approximately 60 per cent has come from old filled stopes. Most of the remaining 40 per cent has been mined by the shrinkage system; the new Arctic orebodies are likewise being prepared for shrinkage, to which they are well adapted.

The mining cost for 1926 was $1.34 per ton, which includes $0.37 for development. In recent months, however, the mining cost has been $2.50 to $3, of which $2 to $2.50 was for development.

Milling

Coarse crushing is done by an Allis-Chalmers gyratory (No. 4, Type N), which is followed by a 5x5-ft. Allis-Chalmers ball mill, using discharge grates and manganese steel liners, with 4-in. chrome steel balls. A Bunker Hill screen sends plus-14-mesh material to the 5x18-ft. tube mill, and the undersize goes directly to two Deister Plat-O roughing tables. The tailing from these tables goes to a 4 ft. 6 in. x 19 ft. 8 in. Dorr duplex classifier, which is in closed circuit with the tube mill. Grinding is carried to 70 per cent through 200 mesh, using mine rock as pebbles; these are sorted out by the gyratory crusherman.

The classifier overflow goes to three Deister Plat-O sliming tables, a middling cut from each of which is reconcentrated on two similar tables. From the reconcentrating tables a middling cut is passed over a finishing table. A 200- to 500-oz. concentrate is made, which goes



T. H. Stephenson, accountant, C. D. Thomas, mine foreman, U. O. Greenan, general superintendent, and E. M. Bagley, mill foreman

to Utah smelters, the ratio of concentration being about 24 to 1.

Counter-current decantation is followed in the cyanide plant, using five Dorr thickeners and two Dorr agitators. Oliver filters and Merrill precipitation, with Crowe vacuum, are used, with Aëro brand cyanide of 50 per cent NaCN strength. No trouble has been experienced from fouling of mill solutions.

During 1926 it was necessary to mill a maximum tonnage, as the grade of the heads dropped to 8.05 oz. and the price of silver likewise slumped. A high figure of 4,948 tons per month was reached, although the mill was designed for 3,000 to 3,500 tons, but extraction dropped to 77 per cent for the year. Present extraction is about 84 per cent, to which cyanidation and concentration contribute equally.

Milling costs averaged $2.58 per ton in 1926, fluctuating greatly, as in all small plants, as the tonnage increased or decreased.

The extremely hard ore from the Arctic Tunnel has reduced the monthly tonnage below 3,000. To increase grinding capacity, a Dorr classifier is being placed in closed circuit with the ball mill, and Danish pebbles are replacing mine rock in the tube mill. A sorting belt is also being installed above the gyratory, which will permit elimination of the inevitable wall-rock.

Marketing

Concentrate serves as a back-haul to Beowawe, from which point it is shipped to the Midvale, Murray, or International smelters, near Salt Lake. It is hauled in cyanide cans and shipped in bulk. Bullion, 600 to 950 fine in silver, is shipped to Selby. The gold content is small. The marketing cost in 1926 averaged $0.45 per ton milled, but this item will be more serious in future, as the ratio of concentration has decreased from 110 to 1 to 24 to 1.

Power is supplied by two 200-hp. Fairbanks Morse "Y" engines, burning 27 plus fuel oil, and operating 460-volt alternating-current generators. Fuel oil costs approximately 11c. per gallon at the mine, thus radically increasing power costs, which range from 2 to 3.05c. per kilowatt-hour, depending on the load on the engines.

Crushing hours since August, 1926, have averaged 94.2 per cent of the total time. The 5.8 per cent of lost time is about equally divided between shutdowns from mill and from power-house causes, the latter being routine shutdowns to clean ports, change pistons, and the like. A water softener that will be installed soon is expected to reduce shutdowns from power-house causes to about 1.5 per cent of the total time. Under present conditions a hard incrustation in the water jackets causes unequal cooling, with its obvious train of harmful results.

Power costs are an important item at Cortez, the 1926 average being $0.95 per ton milled. This cost is, as customary, distributed among the various mine and mill accounts.

A 150-hp. Fairbanks Morse "Y" engine operates a Sullivan compressor, additional high-pressure air being furnished by two Chicago Pneumatic "hotheads."

Following is a summary of the total costs per ton, for 1926:

Mining	$0.97	General, administrative and executive expense, including boarding house loss	$0.65
Development	0.37		
Transportation to mill	0.14		
Milling	2.58		
Marketing	0.45	Total cost per ton	$5.16

The Future

The newly developed orebody is now known to be 710 ft. long, 160 ft. high, and from 2 to 25 ft. in width. The average grade is 31 oz., and the average width about 6 ft. Its easterly, upward, and downward limits are as yet unknown. Expectation of a long period of profitable operation seems to be thoroughly justified.

Industrial Utilization of Aluminum Alloys

H. Pommerenke and P. Herman (*Rev. Met.*, 1927, 24, 297-306) say that for most industrial purposes, especially for automobile parts, the most satisfactory aluminum alloy is that containing 8 per cent copper together with not more than 3 per cent of impurities such as zinc, lead, iron, silicon, and tin. The strongest castings are obtained by melting the alloy below 700 deg. and casting at 675 deg., whereby a homogeneous fine structure is obtained with a hardness of 70 and a tensile strength of 15 kg. per square millimeter. The best heat treatment of this alloy consists in annealing for three hours at 500 deg., quenching in cold water, and aging at 190 deg. for one hour. The Brinell hardness should then be 130 and the tensile strength about 30 kg. per square millimeter. Overheating the alloy during melting results in coarse-grained, weak castings which cannot be successfully heat-treated.

The Las Condes Copper District

In the article entitled "The Copper District of Las Condes, Chile," by Lester W. Strauss, which was published in the *Engineering and Mining Journal* of Aug. 13, the following corrections are called to the attention of readers by Mr. Strauss: P. 257, first column, line 33, the two ball mills are each 6 x 6 ft.; 2d column, line 20, the period covered is from 1865 to March, 1927. On p. 258, first column, line 24, should state that the sum is a total loss; in line 11 of the second column, "visible" should be "estimable"; and in line 39, following the word "data" should be added "prior to 1918."

DISCUSSION

"Der Flotations-Prozess"

THE EDITOR:

Sir—Your issue of July 30 contains a review of my book, "Der Flotations-Prozess," which calls for a reply.

That I omitted to cite the valuable papers dealing with flotation in the American literature, I regret, and apologize for it; in a second edition I shall endeavor to remedy it. My reasons were that the volume of the book would have increased considerably, and that very few of the German readers might care to look over the original text, but would be glad to get an extract of the article in question, containing the interesting main points freed of the encumbrances foreign to the subject. By no means has it been my intention to adorn myself with borrowed plumes, and therefore at every instance I have given the name of the mill where the work or idea referred to had been developed.

About the temptation to generalize more than is advisable so that my conclusions are only to be accepted with a good deal of caution, two cases are cited, but I wish to point out that, in both, the sentences were cut down, and what was inconvenient was left out. The complete first sentence is expressed in my book as follows: "The more frothing agent (pine oil) is added to the collecting oil (tar), the cleaner will be the concentrates and the higher the metal contents of the tailings. *But an excess of pine oil always will raise the waste.*" Again, in the second quotation, the critic omits to cite it completely. It reads as follows: "Pneumatic flotation machines generally produce cleaner concentrates, *for even the finest particles are floated,* whereas agitation machines as a rule produce cleaner tailings, *because on account of the more powerful agitation the coarser ore particles are stirred up and floated, while in the pneumatic machines they generally remain with the tailings, whereby their metal content is raised somewhat.*" That any experienced millman can make high concentrates and low tailings with any machine, I doubt sincerely, and to produce low concentrates with high tailings in any machine does not need an experienced millman.

By criticising Inspiration's practice, apparently I have stepped on delicate ground. Inspiration grinds relatively coarse to 48 mesh and produces 2.2 tons of concentrate to every 100 tons of mill feed. Therefore I wonder why no attempt has been made to separate a large quantity of barren waste in the course of crushing and grinding the ore. American practice stands by large tonnage of low-grade ore, and in default of tonnage, as I know by experience, waste rock is stoped, for it might contain some values that otherwise are lost. The grade of the milling ore is dropping and an everlasting struggle is fought to reduce mining and milling costs and make both ends meet. European and Mexican practice is just the opposite for it provides for carefully sorting out the waste; and it seems to me a sounder policy to cut down stoping widths as far as practicable and run the somewhat underloaded reduction plant on a higher-valued ore that yields more profit, than on large amounts of waste of inferior value.

C. BRUCHHOLD.

Mexico City, Aug. 7, 1927.

* * * *

A Lead Mine Operator Replies

THE EDITOR:

Sir—I have just read your editorial commenting on my discussion of lead prices. Perhaps I did not make my point sufficiently clear, and, furthermore, specifically quoting the paragraph referring to a falling price for the metal, thus directing the attention of the reader to that phase, rather placed it in the front as the cause responsible for the effect upon the public and industries.

I touched too lightly upon the demands made by the storage-battery and cable industries upon our lead resources and present production—with which the development of new fields is by no means keeping pace. In the last paragraph I stressed this point, in referring to the attitude of the large producers, as bringing about a condition "that will not be conducive to the development of further resources in lead production . . . " which was the text of my criticism.

The quotation "prevent a run-away-market" is directly from the word of an official of a leading company made to me when discussing the situation and while considering the examination of a partly developed mine. It was a casual statement of the frame of mind of his company, a position quite justified by its position in the industry, but, if maintained by all, not conducive to opening new mines. Such attitude, though maintaining the level for the time being, would result in two things: first, the postponement of the development of new supplies, which the foresighted must admit is imperative, and, later, when the shortage becomes serious, a runaway market that would be more disastrous to the public welfare and industry than allowing prices to take their normal course.

For the moment the miner can be satisfied with the price of lead. The editorial (July 23) quotes the Western smelter official as solicitous for the miners. It was my purpose to point out that the solicitude should be toward the public and industry, for the reason that any further lowering of the price would further tend to hold in abeyance further exploration and development.

There is a psychology in these things. The fact is that the "leading interests" are scouring the country for potential lead properties. These, Western lead smelters, in common with other miners and refiners, are in the market for mines and have men in the fields. What effect has such a statement as that quoted in your editorial, on the "seller" of a prospective or potential lead producer? I doubt, and did at the time I wrote, the sincerity of his anxiety over the lead miners!

Referring to your editorial discussion of the situation,

the miner recognizes the need of co-operation and interdependence between the mine and smelter, but, as to "the strong competition for ores by the smelting companies . . ." that is a commercial phase which here in Montana at any rate does not exist. We have no competition. If a sample of ore is sent to any of the "independent" companies operating in the Salt Lake Valley, we are advised "We cannot compete with the smelter located in your state on account of the long haul." We have no selective custom plant here. Timber Butte will, and does, take some custom ore, such as can be worked through with its own ores, but there is nothing such as the U. S. Smelting or International companies have in the Utah district. The Northern Pacific Ry. positively refuses to "make" a rate, west-bound, on ores from Montana common points to the Kellogg smelter of the Bunker Hill & Sullivan company on a basis similar to that quoted the Coeur d'Alene mines to East Helena. Why? Because, admittedly, the railroad is after the long haul to the Atlantic Coast, on the bullion. All these things influence the "prospective investor." In view of all the factors, large and small, that enter into consideration, the "sobbing" of the smelter official for the "miner" has a specious ring.

The International is operating mines and buying Colorado lead-zinc ores, separating the metals at the "Valley" smelter in Utah, treating the lead in its own plant, and shipping the zinc concentrate to Great Falls, Mont., for refining! What is the International (A.C.M.) doing in Montana in the way of developing (aside from its mines in Butte) the lead-zinc mines of this region?

Further on in the same editorial you refer to Proposition (2). It is unfortunate that I did not make clear the point that it was not the miner's interest in the present price of lead but the public's interest that will be affected, for, assuming that it is the miner, your discussion has taken a wide angle from what I had in mind. My solicitation for the public is set out above. I think it is generally recognized that lead is in a very different position from copper, both in extent of known occurrences and possible further refinements in recovery. Lead always has been more amenable to concentration than has copper. In flotation it was in advance of copper, and, even with the lead now available through selective flotation of zinc-lead ores, not heretofore marketable, the prospective or potential supply is not commensurate with the rapidly growing consumption of the metal. Thus, ultimately, the interest of the public and of industry centers about the discovery, exploration, development, and beneficiation of any and all sources of lead supply and in that these interests are vitally concerned with the maintenance of a price in proportion of supply to demand, not suppressed or not held back to "prevent a runaway market."

About Proposition (1), in the editorial mentioned, I have stated my source on this point, and the occasion of its making. It is true that a steady market is to everyone's advantage *if that market complies with the laws of supply and demand.* If suppression is maintained, and is supported by a specious plea for the miner (who is not worrying), someone is going to suffer in the end. The official whom I quoted went on to say that they were, at the time of our conversation (lead was around 9c. then), selling under the market to hold it down.

Your editorial goes on to say that all the big companies have mines of their own. As stated above, all, without exception, are seeking more mines! Just at this time, recognizing the situation and foreseeing the future, it is in self-interest that they can, for the moment, use such measures as that tucked away in the editorial of July 23, as a means to an end: that is to say, to discourage the independent investor in securing and developing mines and also to secure what they are looking for with dozens of scouts in the field, at such terms as they can get from a discouraged prospector or owner. With what they want in their possession, control of a metal resource of admittedly limited extent, is it reasonable to expect that they will not hold the price in harmony with the supply and demand, or, perhaps, take all the traffic will bear?

In your last paragraph you refer to the expanded output to meet the demand. It was done by taking lower-grade ores, possible at the higher prices. It cannot be done at the lower, or present, price. The metallurgy of lead has not reached the stage to permit this. The world's supply, at a price profitable according to grade of ore, has not kept pace with the demand. You overlook the spread in lead prices from 1896 when the mines here received $2.85 per hundredweight to recent years when lead touched 10c. per pound. That is the crux of my argument on the supression of the price; there is no contradiction, if the "price of lead," the subject under discussion, is kept in mind.

The further statements in the last paragraph apply for the moment. But the point I attempted to make is that the present supply, at or around 6½c. or even at 8c., is not sufficient to meet the foreseen demands of the industries of the country; that the development of further supplies is imperative; and these can be developed only upon a rising market responding unhindered to laws of supply and demand or, in the near future, the country will pay the fiddler. A LEAD MINE OPERATOR.

[We are pleased to print this comment on the editorial and letter in our August 20 issue. Plenty of lead is being produced at current prices to meet the demand; in fact, reference to the curve on page 435 shows increasing stocks recently. In the light of these data, the decline in price seems very much in order and can hardly have been manipulated. Whether the demand for lead will increase in future years faster than mines can be developed to meet it, with unwarranted high prices as a result of unwarranted low prices now, is a matter of opinion. —EDITOR.]

* * * *

Lower California, the Mysterious

THE EDITOR:

Sir—I was much interested to read your Mexico City Letter on p. 266 of *Engineering and Mining Journal* for Aug. 13, re opening of automobile road throughout Lower California. I am myself almost a "native son" of the Golden West, having grown up and done my first mining in California proper, and I have long been interested in the adjoining peninsula of Baja California, still a part of Old Mexico. It seems, however, to be a land much "wrapt in mystery," as I have thus far been unable to find any works on the country.

I should be greatly obliged if any of your readers could give me the names and general description of any books or literature, either in English or Spanish, dealing with Baja (or Lower) California. What I really want is a work dealing with its rich mineral and agricultural possibilities; and I wish, also, that political and general information be dealt with. A. SPENCER CRAGOE.

Dean Villa, Liskeard, Cornwall, England.

NEWS OF THE WEEK

Summary

WESTERN members of Congress, returning to Washington, report widespread public demand for more recognition on the part of the federal government for the mining industry.

* * *

Gold output of the Province of Ontario for July is valued at $2,813,989 and represents an advance of about 47,500 tons and $220,000 in comparison with the monthly average for 1926.

* * *

Team representing the Anaconda Copper Mining Co. wins first honors at sixth international first-aid and mine rescue contest held at Pittsburgh, Pa.

* * *

Interest in Oatman camp of Arizona increases as a result of the United Verde Co. taking an option on a controlling interest in the Oatman Eureka Gold Mines Co.

* * *

Idea of a sales agency to obtain higher ore prices is revived in the Joplin-Miami district; no definite action, however, has been taken to date.

* * *

Idaho Mining Association publishes statistics indicating financial gain accruing the state from non-dividend paying mining enterprises.

* * *

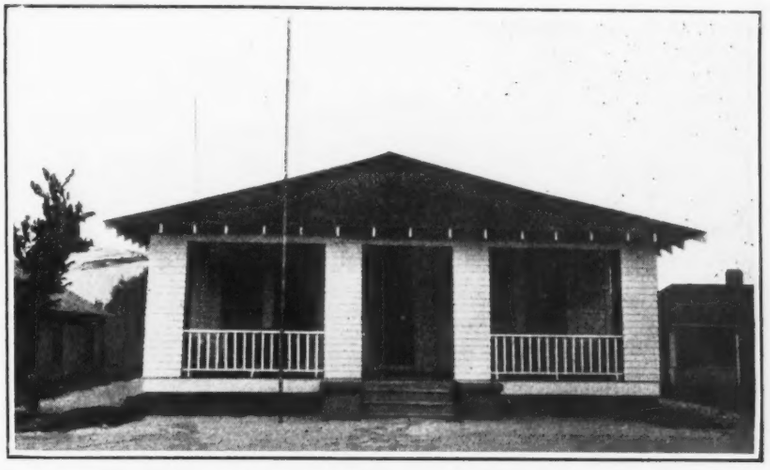
New gold strike at Eabamet Lake, Ontario, north of the Albany River, and a good-sized rush into the district is reported.

* * *

Acting territorial mining engineer of Alaska announces that funds are now available for the assistance of prospectors.

* * *

Tati Co. grants the Selection Trust sole prospecting rights over 1,000,000 acres in Southern Rhodesia.



The new clinic at Picher, Okla.

Greater Federal Recognition of Mining Industry Sought

Western Members of Congress Report Widespread Demand for a Changed Attitude on the Part of the Government

By Paul Wooton
Special Washington Correspondent

WESTERN Senators and Representatives now in Washington are much encouraged by the determination being shown by the public in mining regions to insist upon a changed attitude on the part of the federal government toward the mineral-producing industries. They feel that their efforts in the past to secure more recognition for the mining industry have lacked concrete evidence that there is a widespread demand for these services.

Congress, with little urging, has supplied the money needed to help the farmer solve his problems. Despite the fact that the miner is in desperate need of services, which from their very nature can be performed only by the central government, little progress has been made in efforts to secure the necessary funds. The tendency to be generous to agriculture and niggardly to mining has proceeded to the point where the federal government expends $16 for agriculture for every $1 spent for mining, whereas an equitable proportion would be $16 and $8. The output of the nation's farms has an average annual value of $12,000,000,000. The mines of the country produce $6,000,000,000 of new wealth each year.

Since the effort to secure more appropriations for the Bureau of Mines failed at the last session, resolutions and protests have been approved in a large number of mining communities. Senator Oddie's office is making a collection of these documents and has assembled a large number of letters from individuals on the subject. Senator Oddie, the chairman of the Committee on Mines and Mining, has arranged to return to Washington Sept. 20 for the specific purpose of renewing his effort of the last Congress to secure increased appropriations for the mining industry. He had assumed that, after all that was said and done at the last session, some increases would be allowed in the budget which will be presented to the forthcoming session of Congress. His inability, however, to secure any assurances to that effect leads him to fear that this has not been done. For that reason, he has altered his plans and will return to Washington to go into the matter with the Director of the Budget and the Department of Commerce.

The new clinic at Picher, Okla., which is to serve the Tri-state zinc and lead district, is in full operation. Physical

examinations are being performed daily on from seventy to eighty men. Particular attention is being given chest conditions. The clinic is operated under a co-operative agreement by the U. S. Bureau of Mines, the Tri-state Zinc and Lead Ore Producers' Association, and the Metropolitan Life Insurance Co.

The Department of State is in receipt of a telegram dated Sept. 1 from the American vice-consul at Guadalajara, Mexico, to the effect that he has received a telegram from James H. Howard, general manager of the Amparo mines, stating that federal troops "arrived at the mine yesterday." The vice-consul adds that General Ferreira informed him that federal troops under the command of a colonel were being sent to Amparo, Pledrabola, and Etzatlan.

Idaho Mining Association Publishes Statistics

For several years it has been the custom of the Idaho Mining Association to compile statistics showing the amount of money expended in each county of the state in mining development and for mining equipment independent of the dividend-paying mines. The secretary of the association, Ravenal Macbeth, has recently completed the figures for Shoshone County, in which is situated the Coeur d'Alene mining district. His report shows that during 1926 $4,570,514 was expended in mining development and equipment, and it is estimated that one-third of this amount came from local companies and individuals, and that two-thirds was "outside money." In 1925 the total expenditure was $3,435,666, the increase in 1926 being $1,134,848.

The figures for 1926 include the expenditures for annual assessment work on 3,558 unpatented mining claims and also the expenditures required by state law on 287 new mining claims located during the year. Publication of these figures conveys an impressive idea of the large outlay annually made for mining development from which no profit is derived, independent of expenditures made by the dividend paying mines. In fact, the figures are compiled and published to offset the impression that prevails in some quarters that the state receives little benefit from the mining industry, and that the mineral resources are being depleted for the benefit of stockholders residing outside the state.

Increased Gold Output in Ontario, Canada

Reports from Ontario gold mines for July show a total of 355,448 tons of ore milled, yielding crude bullion to the value of $2,813,989, according to a report to the U. S. Department of Commerce. This is an increase of about 4,500 tons and $142,000 over the record for June. Compared with the monthly average for 1926, it represents an advance of about 47,500 tons and $220,000.

Several Arizona Properties Under New Control

Oatman Eureka Gold, Old Congress, Signal and Richinbar Mines Involved —Two Strikes Reported

INTEREST in the Oatman camp has been increased in the last week as a result of the action of the United Verde Copper Co., of Jerome, in taking over the Oatman Eureka Gold Mines Co. The property involved consists of eight claims and fractions, situated to the south of the Telluride and Tom Reed properties. The tract has always been considered one of the promising undeveloped properties in the district. Arrangements have been made with the Lucky Boy Mining Co. to use that company's shaft, and from the bottom of this 400-ft. shaft a crosscut will be run to the Oatman Eureka vein, a distance of about 500 ft. Before starting the crosscut, the shaft will have to be unwatered and retimbered from the 250 to the 400 level.

The old Congress mine, situated near Congress Junction, has been taken over by the Sonora Development Co., which is now re-treating the tailings dump on the property. Later, operations will be extended to the underground workings. A 200-ton mill has been constructed, and it is estimated that 80 tons of concentrates and crude ore will soon be shipped daily from the property.

Frederick O. R. Nansen and Joseph Irving have made arrangements with the Western Metallurgical Co., of Humboldt, to take over the old Signal Mines Co., which includes the McCracken property, west of Signal. These mines were wonderful silver producers in the eighties, and considerable lead ore still remains in the workings. Ores will probably be shipped to the Phelps Dodge concentrator at Humboldt for treatment.

THE historical Richinbar gold mine, 50 miles south of Prescott, after having been idle for twenty years, is to be reopened in October. The property has been purchased by a group of New York and Los Angeles capitalists, who plan to drive a tunnel 2,000 ft. long under the old workings to reach the principal vein at a depth of 700 ft. below the surface. A 200 ton mill and a number of camp buildings will be constructed. These operations will involve an outlay of $300,000.

Reports from Stockton Hill, just north of Kingman, are to the effect that one of the richest strikes of recent years in the district was made a few days ago on one of the properties of the Comstock Silver-Bevis Divide Co. The ore is in one of the leases on the property.

A new high-grade strike has been made in the Tom Reed gold mines at Oatman. A 4-ft. ledge of ore has been intersected on the 500 level of the Ben Harrison workings. This is the same oreshoot which had previously been encountered on the 300 level. The oreshoot which the company recently opened up on the 700 level of the Aztec shaft is producing high-grade ore. The Tom Reed mill is handling 100 tons of ore per day.

The Belmont Copper Co. is driving two crosscuts on the 1,000 level to block out ore encountered on the 1,150. Another long crosscut is being driven on the 1,450 toward the Grand Pacific, where 1,600 tons of 17 per cent copper was extracted near the surface some years ago. This crosscut is already in 600 ft., and has still 500 ft. to go to reach its objective. Work is being prosecuted at the rate of about 150 ft. a month. Two other crosscuts are being driven on the 1,600 level. They are in the direction of the Belmont and Eureka veins. The ore bin on the surface has just been completed, and shipments to the Magna smelter will begin soon.

About 16 miles north of Phoenix, in the Cave Creek district, on the site of the old Contention mine, a thick ledge of ore is reported to have been opened up which has been traced to a depth of 80 ft. from surface. Sufficient water has been reached at a depth of 140 ft. to operate the mill. The mine has been idle for more than thirty years.

At present most of the development work being done by the Verde Central Mines, in the Jerome district, is located on the 1,000, 1,700, and 1,900 levels. Three lenses of ore have so far been developed. Lateral drifting has been done as far as 3,000 ft. from the shaft in several directions, and diamond drills will now be used from these drifts. The diamond drilling will probably be done by contract.

Regular shipments of asbestos are being made from the Johns-Manville Corporation's property at Chrysotile. A Diesel engine, lighting plant, and compressor have recently been installed, and steady employment is being given to 50 men. C. H. Shoemaker, vice-president and general manager of the corporation, recently made a trip of inspection to the property from his headquarters in Quebec.

Comanche Mine Active

The Comanche Mining & Reduction Co. of Los Angeles, operating at Blind Spring Hill, Mono County, Calif., near Benton, has increased its holdings by the purchase of ten adjoining claims. This gives the company a total of 58 claims, covering 1,160 acres, practically the entire Blind Springs Hill, in which are included several former producers having records stated to total in excess of $6,000,000. The main working crosscut adit is being extended, being now in 3,600 ft. The ores carry lead, silver, and copper.

Gold Ore in Death Valley

Discovery of a 12-ft. ledge of gold-bearing ore is reported at the Skookum mine, on the west side of Death Valley, Inyo County, Calif., by the World Exploration Co.

Quincy Mine Working Full Force in No. 6 Shaft

Reopening of Cliff and Phoenix Mines Delayed—C. & H. Treating Sands at Lake Linden Plant

A FULL force of men is again employed in No. 6 shaft of the Quincy mine, in the Michigan copper district, which was closed on account of a fire in No. 2. Mining also is under way in a few levels above the 86 level in No. 2. The bottom three levels are filled with water, and as soon as these are dewatered, opening work will be resumed. A station was being cut at the 89, or bottom, level when the fire broke out, preparatory to crosscutting to the East and Main veins. Three shifts are being worked in repairing No. 2. The shaft probably will be out of commission for some time, as there is considerable timbering to do. The fire damage leaves only No. 6 for hoisting, although there is a possibility No. 8, idle for a number of years, may be reopened. This would give employment to men who have not been placed since the fire and would help to hold the organization intact. Quincy lost a full month's production on account of the fire in No. 2.

ROCK of unusual richness is being encountered by Arcadian Consolidated in the so-called "West" vien, which was opened by the crosscut driven east from the 1,250 level of the New Baltic shaft. The identity of the lode, which is 18 ft. wide, has not been definitely established, but possibly it is the northern extension of the Arcadian or Isle Royale vein. Drifting also is being carried on to the south in No. 8 conglomerate. Although some copper is in evidence, the present showing is not so pronounced as in the "West" vein. Lately considerable water has been encountered in the conglomerate, and it is of such volume as to retard the work in this opening. Both veins will be opened by drifts running north and south.

Some time will elapse before it will be possible for Calumet & Hecla Consolidated to proceed with its extensive exploratory program at the old Cliff and Phoenix mines in Keweenaw County. At the Avery shaft at Cliff, dewatering has reached the 13 level, and it will be necessary to go as far as the 21. At the Crocker shaft at Phoenix, work has been somewhat delayed by an explosion of marsh gas, resulting in the death of two of the workers and injury to others. The Pola air-lift method is being used in dewatering both the Avery and Crocker shafts. It is believed the accident in the Crocker shaft was caused by the release of methane when the compressed-air pipe was inadvertently pushed through the column pipe into the water, freeing the gas, which was exploded when the men approached the mouth of the shaft with lighted miners' lamps.

Calumet & Hecla Consolidated is shipping conglomerate sand from the site of the first Calumet stamp mill in Calumet to the reclamation plant at Lake Linden, where it will be retreated. The old tailings are rich in copper, running, it is estimated, over 30 lb. to the ton. It is said there are approximately 112,000 tons of the sand in the deposit.

Isle Royale mineral now is being smelted at the Michigan smelter, in Houghton. This arrangement, it is understood, will continue until the proposed new furnace is erected at the Calumet & Hecla smelter at Hubbell. Isle Royale is producing about 1,000,000 lb. of refined copper per month. Rock continues of good grade, and considerable mass copper is being picked out at the mill and shipped to the smelter.

In the conglomerate department of Calumet & Hecla Consolidated, pillar mining in No. 9 shaft of the Hecla branch is proceeding above the 65 level and in the bottom levels of No. 6. These shafts are adjacent to No. 7, through which ground below the 81 level haulage tunnel will be mined. In No. 4 shaft in the Calumet branch, repair of the fire damage is under way below the 40 level.

Cheap power for mining operations and development will be afforded in Ontonagon County when the project to utilize the water power of the Ontonagon River materializes. A group of water-power builders and operators have made a survey of the field, and it is expected their plans will be formulated within thirty days. Permission will be asked of the Ontonagon County board of supervisors to build a dam on the river to develop 5,000-hp. or more. Franchises already have been voted by townships in the county for the running of power lines, but it is planned to extend the field of operations if the business prospects warrant such action.

Approximately 100,000 lb. per month of mass copper is being mined from the fissure vein in Ahmeek's No. 2 shaft. The vein is being mined on the 21, 28, and 29 levels. It appears to be widening with depth, being much thicker than it was on the 17. An improvement in the character of ground has been noted at depth in No. 3 shaft. Drifting is proceeding from the 30 to the 34 levels, and stoping above the 31.

The Quincy Mining Co. of Hancock, Mich., has marketed a total of 300,000 lb. of flake or shot copper, which was purchased for the manufacture of blue vitriol. The copper was turned out in this form at the Quincy smelter, where a machine, the only one of its kind in the Michigan district, has been installed.

In the recommendations of the Michigan Tax Commission to the state board of equalization, Houghton County's valuation is reduced from $59,000,000 to $50,000,000 and its percentage of the state tax from 0.76 to 0.66. A reduction of $500,000 is recommended for Keweenaw County, with a reduction in percentage from 0.18 to 0.16.

The Ford Motor Co., which is a large buyer of Lake copper, is now using its own steamers to transport the metal from the smelter docks to Detroit.

Little Change in Nevada's Bullion Production

Increase Expected During Next Few Months—Considerable Activity in Ramsey District

BULLION production from the Tonopah, Nev., mining district for July was valued at $163,000, which is slightly above normal. Both the Tonopah Mining Co. plant at Millers and the West End Consolidated plant at Tonopah receive some custom ore from the Divide district, and there is every indication that bullion from this source will show a substantial increase during the next few months. No recent discoveries of importance have been reported from the Tonopah district and present operations are normal.

July bullion production by the Gold Circle Consolidated Mines Co., operating at Gold Circle, Nev., amounted to $33,000. The company is milling 90 tons of ore per day, the ore coming from the Jackson-Grant mines of the company. An extensive development campaign is being carried out which will eventually reopen the lower levels from the old Gold Circle 950 ft. shaft. This shaft is now filled with water to the 600 level and the water is to be drained through a long tunnel.

CONSIDERABLE interest is being manifested in the Ramsey district, 34 miles southeast from Reno, Nev. An Eastern syndicate has engineers making a thorough examination and sampling of the main property, that of the Ramsey-Comstock Mines, Inc., presumably with the idea of purchasing stock control in case results are satisfactory. The Thomas F. Cole interests own a large acreage in the district, and they have accumulated stock in companies owning near-by tracts. Developments in the Ramsey-Comstock mine have been satisfactory, and the showing on the 500 level, which is the deepest level of the new vertical shaft, is the best in the mine. The vein is said to be up to 25 ft. in width and contains mill ore values in gold across the entire width, with specimen ore on the hanging wall. A raise now being driven on the vein from the 500 level to connect to a winze sunk from an upper level will improve ventilation and permit more rapid development of the vein.

The old Kanrohat property, in Jefferson Canyon, 8 miles northeast from Round Mountain, Nev., has been optioned to San Francisco operators, a first payment made, and plans formulated for resumption of work in the mine and reconstruction of the mill. This property has been optioned many times and partly developed to a depth of 1,000 ft. The last real work was done in 1918, at which time a 150-ton flotation plant was constructed. Most of the available ore was oxidized and would not float. The ore is refractory to cyanide treatment, but the present owners expect to use a roasting process, details of which have not as yet been made known in the district.

Sales Agency Idea Revived in Joplin-Miami District

Promoted by Ore Producers to Obtain Better Prices—No Definite Action Taken to Date

THERE is renewed talk in the Joplin-Miami field of the practicability of a sales agency for handling zinc-ore sales. This talk is revived periodically as zinc-ore prices fall and is as promptly forgotten when prices rise. Just at this time it is being argued that the zinc smeltermen back in 1924 had lost control of the price situation and that in 1925 they organized the Zinc Export Association, at a meeting in Canada, and through it have regained control of the situation until the zinc-ore producers are unable to obtain a fair price for their product, even though curtailment has been greater this summer than ever before. This is the argument that is floating around in the Joplin-Miami district and that is calculated to interest ore producers in the project of a sales agency. As yet, however, no definite steps have been taken.

The Woodchuck mine has proved one of the richest in the Joplin-Miami district, virtually all the ground on the acreage having proved productive. According to a recent statement of R. M. Atwater, Jr., president of the Interstate Zinc & Lead Co., the Woodchuck already has produced more than 800,000 tons of ore, and it is believed the total will be not far from 1,250,000 before the mine is finally abandoned as depleted.

In accordance with a law passed in Oklahoma in 1921, but never enforced in the zinc and lead mines of the state, mine owners of the Oklahoma section of the Joplin-Miami district must have speaking tubes installed in all shafts. Riley Clark, district mine inspector, has notified the mining men that they will have until Sept. 15 to comply with the law and that after that date arrests will be made.

Construction of a new mill on the Empire lease in the Joplin-Miami field, to take the place of the one recently destroyed by fire, has been started by F. W. Evans, of Picher, Okla. The new mill is being built west of the old site and will be powered by gas engines. There will be no mill shaft, the dirt being hauled from the old mill shaft and from the new shaft recently completed on the west forty acres of the tract.

Operations to Be Resumed at Texas Manganese Mine

Preparations are being made to resume on a large scale the mining of manganese upon the ranch of W. A. Cooper, situated 40 miles west of Del Rio, Tex. This ore deposit was mined for a few years before the World War, but the property has been inactive for several years. The ore deposit is situated near to the transcontinental line of the Southern Pacific.

Photo by "The Pittsburgh Post Gazette"

The Anaconda Copper Mining Co.'s winning first-aid team. Front row—L. Bertoglio, L. R. Maillet, L. T. Maillet and Hanford Estabrook. Back row—Cornelius O'Connell, captain; W. V. Thrasher, manager; John Dickinson and Robert Gill

Anaconda Team Wins First-Aid Contest at Pittsburgh

Mine Rescue and Combined Awards Go to Penelec Coal Corporation—Three-Day International Meet Draws Teams From Thirteen States

TEAMS of the Anaconda Copper Mining Co., Butte, Mont., and the Penelec Coal Corporation, Seward, Pa., won first honors in the first-aid and mine rescue contests, respectively, at the sixth international first-aid and mine rescue contest, held under the auspices of the U. S. Bureau of Mines, at Pittsburgh, Pa., Aug. 30 and 31 and Sept. 1.

Forty-nine first-aid teams and nineteen mine rescue teams, representing coal and metal mines, quarries, and oil-producing operations in thirteen states, completed in the contest. The first-aid teams entered represented the winning teams from contests held at different places in various parts of the country. Approximately 300 teams participated in these local and inter-company contests, and the winners were selected to be sent to the international contest.

Announcement of the winners and the awards was made at a banquet held the evening of the last day of the contest. Presentation speeches were made by Dr. R. R. Sayers, chief of the health and safety branch, U. S. Bureau of Mines; Dr. M. J. Shields, field director, American Red Cross; H. Gandy, Jr., editor of the *National Coal Bulletin*, and C. B. Avel, past president of the National Safety Council.

Winners in the first-aid contest were: First honors, team representing the Anaconda Copper Mining Co., Butte, Mont.; second, Phelps Dodge Corporation, Morenci, Ariz.; third, Standard Oil Co. of Louisiana, Baton Rouge, La.

In the mine rescue contest the winners were: First honors, Penelec Coal Corporation, Seward, Pa.; second, Frick Coke Co., Mount Pleasant, Pa.; third, Phelps Dodge Corporation, Bisbee, Ariz.

Combined first-aid and mine rescue contest winners were. First honors, Penelec Coal Corporation, Seward, Pa.; second, Phelps Dodge Corporation, Bisbee, Ariz.; third, Pittsburgh Coal Co., Gallatin, Pa.

Awards won by the Anaconda Copper Mining Co.'s team included: Congressional bronze medallion, awarded by act of Congress; silver cup presented by Illinois Coal operators' Association and United Mine Workers of America, District No. 12; silver cup presented by *Coal Age;* silver cup presented by Ironton Engine Co.; silver cup presented by

Cups donated by Mine Safety Appliances Co. to winning combination mine-rescue and first-aid team

National Coal Association; and gold medals from the National Safety Council to each member of the team.

The team of the Penelec Coal Corporation won the following awards: Joseph A. Holmes challenge trophy, to be held until the next international contest; Congressional bronze medallion; silver cup presented by Mine Safety Appliances Co.; silver cup from National Safety Council, and gold medals from the National Safety Council to each member of the team.

The chief judges for the first-aid contest were as follows: Dr. C. H. Henninger, president, Allegheny County Medical Society, Pittsburgh, Pa.; Dr. M. J. Shields, American Red Cross, Washington, D. C.; J. T. Ryan, vice-president and general manager, Mine Safety Appliances Co., Pittsburgh, Pa. The chief judge for the mine rescue contest was W. G. Duncan, associate professor of mining extension, Pennsylvania State College, State College, Pa.

Funds Available in Alaska for Prospectors

Aid for Transportation Purposes Only —Year's Territorial Residence Required of Recipients

THE acting territorial mining engineer of Alaska, D. B. Stewart, announces that funds are now available under recent territorial legislation for the assistance of prospectors. This aid is to be given to the extent of $150 a year for transportation purposes only, and is restricted to American citizens who have been resident in the territory for at least a year. The grant requires recipients to report within a year to the Commissioner of Transportation the nature of any discoveries made and the conditions in the locality. This information will be collected and made public, chiefly for the guidance of other prospectors.

If current investigations in Alaska by the Union Sulphur Co. are successful, sulphur may soon be added to the mineral exports of the territory.

The Jacob Marty mine, at Windham, is sending ore to the mill over an aerial tramway, and when the necessary adjustments have been made it is proposed to put mine and mill in full production.

Operating the Vogel property north of Haines, the Porcupine Gold Mines Co. has completed the installation of two miles of high-line flume and 6,000 ft. of hydraulic pipe. The plant should be in operation at an early date.

The Inspiration Point Mining Co., developing a silver-lead prospect on the White Pass and Yukon Ry., has a shaft down 60 ft. in ore carrying values from $50 to $80. It is proposed to ship the higher grade ore to a smelter and mill the rest.

D. C. Sargent, of Washington, D. C., and C. L. Graves have been carrying on exploration work by diamond drilling on copper deposits on Orange Hill, Nabesna. Ore has been proved to a depth of 575 ft. Average values are stated to be about 6 per cent copper, with considerable gold and silver. Probable ore is estimated by the owners at 200,000,000 tons.

At Valdez the Ethel Mine, on Mineral Creek, shows gold quartz carrying high values. Continuation of underground development is planned till next spring, when the management estimates that enough reserves should be blocked out in the two ore shoots to warrant erection of a mill.

An English syndicate has bonded the Ryan group of eight claims at Fairbanks for $175,000. The property has been extensively developed, and estimated gold quartz ore reserves are valued at $4,000,000. It is proposed to equip the property with a large mill.

P. R. Bradley, general manager of Alaska Juneau, has been on a visit to the property and reports the outlook for the company to be favorable. Steady improvement is observable, and economies continue to be effected in mining and milling operations, as a result of the more experienced and capable labor now available.

Bluestone River, Port Clarence, north of Nome, is being investigated as to its dredging possibilities. Mining at Livengood Creek has been hampered by a shortage of water.

Many Gold-Mining Camps of California Active

Several Properties Reopened in the Grass Valley District—Rich Strike Near Placerville

DRIFTING is in progress upon the 350 level of the Grass Valley Boundary mine, in the Grass Valley district of California. Additional pumping equipment has been secured by the South Star, formerly known as the Allison Ranch mine, and unwatering is to be started in the near future. The Empire, North Star, and Idaho-Maryland are being steadily operated. At Nevada City, the Murchie mine is being reopened by the American Foundation Co. and a drain tunnel is being extended to the workings. Le Compton mine, in the Willow Valley district, is being reopened by E. J. N. Ott. The Gracey mine, on Canada Hill, is also being reopened and preparations are being made to sink a new shaft. At the Triomphe mine, east of Lumpkin, Butte County, a five-stamp mill and an air compressor are being installed. The Merger Mines Co., at Blue Tent, has sunk a 450-ft. shaft on the Davis and Randolph property and is now considering the installation of milling facilities.

A report has been made of a rich strike on the claim of J. W. Hines in Pleasant Valley, southeast of Placerville, Calif. Apparently a section of unworked Tertiary river channel has been struck at 50 ft. below the surface.

THE principal working shaft of the Kennedy Mining & Milling Co. at Jackson, Calif., has reached a vertical depth of 4,764 ft. A station is being cut at the 4,650-ft. point and a new level is to be opened out. Reports from Georgetown, El Dorado County, indicate activity in a number of the smaller gold properties in that vicinity, particularly at the Stanton mine, at Georgia Slide, on Canyon Creek, two miles north of Georgetown, and at the Josephine mine, in the Volcanoville district. The latter is bonded to Warren C. Green, of San Francisco.

The Princess gold-silver property, in Plumas County, is reported leased to A. G. Minter, Frank Metz, and Bert Benson, of Reno, Nev., who will begin development work on a 5-ft. ledge which is said to show promising values.

The Yellow Aster mine near Randsburg, Calif., has rehabilitated a ten-stamp milling plant.

Alaska Juneau in July

Alaska Juneau in July, 1927, mined and trammed to mill 353,000 tons, yielding $196,000, or at the rate of 55.59c. per ton. Operating expenditures were $173,000, or 48.94c. per ton, and operating profit was $23,500, or 6.65c. per ton. Other expenses and accrued charges, totaling $20,000, left a surplus of $3,500 for the month.

Mexico City Letter

By W. L. Vail
Special Correspondent

Violence in Guadalajara Districts Caused by Red Leaders

Mexico City, Aug. 24.—According to recent reports, the strike in the mining districts of Guadalajara, particularly in the districts of Amparo, Mazata, and Piedra Bola, is taking on alarming symptoms because of the outlawry of irresponsible elements. It is charged that labor leaders, in opposition to instructions from the general organizations, have violently seized certain properties and have defied state authorities. American interests are reported to have protested to their nearest consular representatives and have asked for protection. Governor Ramirez of Jalisco has promised protection on the part of the state authorities, but has apparently not been able to give the required guarantee. In the meantime the Department of Labor, Commerce and Industry in this capital has taken a hand in the matter and is attempting to adjust the differences between the employers and workmen. The general impression is that the trouble has been caused by precipitate action of Red leaders, unauthorized by the general labor organization, and that the strike will be declared illegal after a study of the situation by the federal authorities. Several thousand men are reported to be out of work.

The government has set Sept. 30 as the final date for registering mining titles. Those failing to register will be subject to the penalities established by law. The time for this registration has already been extended once, and the department says that under no circumstances will further extensions be granted.

Eight hundred and fifty thousand silver pesos went into the melting pot at the mint on Aug. 23. This is the initial step in the plan of the federal government for the rehabilitation of the silver peso by removing 5,000,000 from circulation. In addition, stoppage of coinage of the same pieces of course follows. These measures, together with the arbitrary declaration on exchange, it is hoped, will bring the silver peso back to normalcy.

Probably on the idea that the prices of silver, lead and zinc cannot go much lower and must react soon, some prominent mining men operating in Mexico are acquiring by purchase or option considerable numbers of mining properties now lying dormant. The assumption is that reserved stocks of metals abroad are being depleted and that the reduction of production throughout the country must necessarily force a rise. It is also believed that price depressions are caused partly by financial manipulations.

Change to Underground Methods at Ruth Property

INSTALLATION of a $1,000,000 plant designed for underground mining at the Ruth mine of the Nevada Consolidated Copper Co. near Ely, Nev., is well under way. A gradual transition, which will consume about five years to complete, is to be made from open-pit to underground operations.

A 30x5½-ft. shaft, inside measurement, 710 ft. deep, has been sunk. This is to be concrete lined from top to bottom, including concrete approaches to haulageways and concrete ore pockets. A steel gallows frame, 155 ft. high, has been erected. This will be served by a circular steel ore bin of 1,000 tons' capacity. Two semi-automatic, remote-control hoists will be installed. The smaller hoist will be used as a man hoist. A compressor with a capacity of 4,000 cu. ft. a minute is being put in, and an outdoor substation with a capacity of 7,000 kva. is in course of construction. The change house, capable of accommodating 500 men, will be of concrete and steel and have space for offices, warehouse, and temporary hospital quarters.

Butte & Superior to Sink Main Shaft to 4,000 Ft.

It is reported in Butte that the Butte & Superior Mining Co. will sink its main shaft to the 4,000-ft. point. The company has crosscut the Rainbow Lode on the 3,600 level, at which point it is about 250 ft. in width. Some copper stringers were cut south of the shaft, and the vein now is being drifted on to the east and west.

Ardsley Butte Mines Corporation is cutting a station at the 350 level, at its Highland property, in the southwest portion of Butte. A crosscut will be run to tap the Highland vein, also to tap a vein of quartz which cut the shaft below the 300-ft. point and which assayed satisfactorily in silver.

Butte Copper Consolidated Mines has shipped the third car from its Joe Dandy property, near Radersburg. This car continued forty tons, assayed 5.45 oz. of silver per ton, and 41 per cent lead, and gave net smelter returns of $1,305. Montana Power Co. has connected its line into the property, and an electrical compressor and air hoist have been installed. A new shaft is being sunk, the old shaft workings having been let to a group of leasers, headed by Ed. McNulty, prominent mining man of Butte.

Magnesium Refinery Built

The American Magnesium Co., of Los Angeles, Calif., which owns deposits of magnesium salts in Death Valley, Inyo County, Calif., has completed construction of its refinery at Wilmington, Calif. The plant has a capacity of twenty tons of glauber salt crystals, eight tons of light magnesium carbonate, and five tons of epsom salts per eight-hour shift.

Johannesburg Letter

By John Watson
Special Correspondent

Potgietersrust Platinum Issues Statement on Milling Results

Johannesburg, Aug. 2—The technical committee of Potgietersrust Platinum, Ltd., reports that during the quarter ended June 30, 5,650 tons of ore was crushed and treated by the flotation process, producing 109 tons of flotation concentrates. Daily assays showed a screen value of 6.56 dwt. platinoids and an average residue of 1.76 dwt.; but the actual recovery as concentrate is estimated at 3.98 dwt. per ton of ore treated, out of which 1.5 dwt. is platinum and 2.48 dwt. are palladium. The concentrates also contain a small amount of other platinum-group metals. The amount of nickel and copper in the 109 tons of concentrate is estimated at 5.7 tons and 3.3 tons, respectively. The directors have been endeavoring to find the best method of dealing with the concentrates. Early in the year, two parcels of concentrate were shipped to Europe for experimental treatment. The first lot, weighing 10 tons, went to the Mond Nickel Co., Ltd., and was smelted to a matte in South Wales. A further lot of 100 tons has been sent for further experimentation. The other parcel, shipped early in the year, went to a firm at Frankfurt, Germany; but the results of tests made on this lot have not yet been reported. Recently a small parcel was sent to the Chemical and Metallurgical Corporation, Ltd., of London, which claims to have evolved a satisfactory process of treatment.

On the gold mines, during June, 21,915 Europeans and 202,012 natives were employed. The grand totals for mining were: Europeans, 27,568; natives, 314,742; total, 352,310, representing a decrease of 3,809 when compared with May. Alluvial diamond diggers and prospecting concerns, showed a total of 9,852 employed, a decrease of 2,601 compared with the figures for May.

Oroville's Last Gold Dredge To Be Dismantled and Shipped

The dredge of the Thurman Gold Dredging Co. at Oroville, Butte County, Calif., has been sold to C. H. Thurman, one of the principal stockholders. It is estimated that in another month this dredge, the last to be operating in the Oroville district, will have finished its available ground. It is to be dismantled and shipped, probably to Alaska. The dredge has a record of over $2,000,000 worth of gold recovered in twenty years, having been built in 1906. The total running time was 87 per cent of full time; gravel handled, 30,316,814 cu.yd.

London Letter

By W. A. Doman
Special Correspondent

Selection Trust Receives Prospecting Rights in Southern Rhodesia

London, Aug. 23.—It is announced that the Tati Co. has granted to the Selection Trust (A. Chester Beatty's company) sole prospecting rights over a million acres in Southern Rhodesia. It is further stated that on the Roan Antelope property (Rhodesia), belonging to the same group, three American engineers are making an investigation, two of them being interested in the treatment process to be adopted.

Negotiations between the Harrimans and the Soviet authorities with reference to copper concessions have come to a standstill, it is said. The chief obstacle appears to be that the Soviet stipulates that it shall have the first claim on the metal produced.

From inquiries made from one of the largest dealers, it is clear that business in diamonds has been bad, and is still bad, but that it has taken on a very satisfactory turn. The alluvial discoveries have frankly upset the conference producers, although "the position now is a little better than at any previous time this year; the alluvial stuff is uncontrolled and affects regular trading." The syndicate naturally does not like to see alluvial stones thrown on the market at any price, and those directing it certainly are against the proposal made in South Africa that the alluvial diggers should be represented on a diamond selling board.

Last week mention was made of a rumor that friction existed between the directors of the Rhodesia Congo Border Concession and Minerals Separation on the question of policy, and the fall in the price of the shares was reported. A. Chester Beatty is back in London, and it is now currently stated that the differences have been removed. The result has been a rally in the quotation. As there are big concessions to be exploited, and many opportunities for metallurgical work, satisfaction is expressed at the settlement. The terms of the agreement have not been made known. In some quarters it is said that Minerals Separation felt hurt at having to wait for results while other people made fortunes in the share market.

More Manganese Deposits Discovered in Russia

According to a statement by the mining department at Moscow, vast deposits of manganese ore have been discovered in the northern part of the peninsula of Mangischalk in the Caspian Sea, on the Asiatic side. Examinations carried out by Professor Bojarunas and analyses made by mining experts of the mining department show that the Mangischalk ores are of the same first-class quality as Tschiatury ores, but that the newly discovered deposits are considerably more extensive than the hitherto known Caucasian deposits. Of visible deposits the geological expedition of Professor Bojarunas estimated a quantity of at least 400 million Russian poods.

Mining Industry Represented on Advisory Board

THE mining and related industries are well represented in a group of forty-one leading business executives who have organized an advisory board of the American Management Association, feeling that improved management methods are essential in maintaining present prosperity and that knowledge of such methods should be spread more quickly throughout business.

Both production and distribution will be included in the scope of the board, which will serve in guiding the policies of the association and in focusing its increased research facilities on pressing industrial problems. Among the fields in which new management methods are now being developed and tested by the association and its members are those of labor efficiency and labor relations, financial control and budgeting, sales research and salesmen's training, office management and personnel administration.

Sam A. Lewisohn, vice-president, Miami Copper Co., is chairman of the board of directors of the association and a member of the advisory board; C. F. Dietz, president, Bridgeport Brass Co., and Acheson Smith, president, Acheson Graphite Co., are members of the advisory board.

Operations Resumed at the McKinley Mine

Operations have been resumed at the old McKinley mine, situated at Lane City, near Ely, Nev., and named after former President McKinley, who was a large stockholder in the venture nearly thirty years ago. The mine was formerly operated by John Saxton, the President's father-in-law.

The mill has been equipped by the Saxton Leasing Co. with flotation machinery to treat ore carrying good values in silver and gold. A new shaft has been sunk 170 ft. and a new hoist engine installed.

Geophysical Prospecting in Spain

The Instituto Geologico y Minera of Spain has organized a division for geophysical prospecting and is using German methods for testing the supposed petroleum fields of the province of Burgos, the metalliferous veins in Guadalajara and subterranean waters about Madrid.

Toronto Letter

By Our Special Correspondent for Northern Ontario

New Gold Strike Reported at Eabamel Lake—Amulet Drills Good Ore

Toronto, Aug. 27—A new gold strike is reported from Eabamel Lake, north of the Albany River, and there is a good-sized rush into the new section. Airplanes into the district are booked to capacity, and many prospectors are going in by canoe. The discovery was made by Lorne B. Howey, who discovered the Howey Red Lake Gold Mines, and by William Smith, two prospectors representing two Haileybury syndicates. According to report, the vein is from 24 to 48 in. in width. The location is about 100 miles north of the railway.

Another good intersection has been cut by diamond drills on the Amulet property, and on what is known as the No. 11 orebody a width of 50 ft. has been shown which contains good values in copper and zinc. It is too early to state whether this is the continuation of the 8-9-10 orebody, which is now estimated to contain $3,000,000 worth of ore, but, as it is only 300 ft. away, there is a possibility that the two may be connected. On the surface there was a showing over an area of 50 by 70 ft. Amulet orebodies are practically all found under a comparatively shallow rock capping, so that it is difficult to determine extensions by surface work.

Good results are being obtained by the Central Manitoba Mines. On the 375 level, what appears to be an entirely new oreshoot has been encountered and drifting for the last month has been in ore of good grade. A winze has also been started, and this is also in ore. The management considers the new development to be very important, as this is the first important shoot of continuous ore which has been found on that level. The new mill should be in position to start operations about Oct. 1.

Triumph Mine Operated by Salt Lake Interests

Two carloads of machinery to equip the shaft of the Triumph mine, near Hailey, Idaho, were recently shipped from Salt Lake City. This property is being worked on a long-term lease, secured from the Haggin-Hearst interests by Salt Lake men, including J. C. Jensen, W. F. Snyder, and the Continental Divide Development Co. The mine has been unwatered, new rails and cars have been installed, and also a compressor, hoists, and other machinery. A two-mile, high-tension power line has been completed, transformers have been put in, and preparations made to ship fifty tons daily of a complex zinc-lead ore.

Societies, Addresses, Reports

In Canada With the British Empire Mining Congress

By A. B. Parsons
Associate Editor

En route, Timmins, Ont., to Winnipeg, Man., Sept. 1, 1927.—This evening finds the Congress a little dizzy but thoroughly pleased. There is ample reason for both feelings. Between 9 a.m. last Monday morning and 4:30 this afternoon, Thursday, it has visited the Sudbury district, source of 90 per cent of the world's nickel; the Cobalt and South Lorrain silver areas; Kirkland Lake, fastest-growing gold camp in the world; and Porcupine, second only to the Rand among the gold-mining districts of the world.

The men have had an opportunity to visit twenty mines, fifteen cyanide plants, a half dozen concentrators, and two smelters. As these attractions conflicted like those of a four-ring circus, everyone saw what he could and necessarily let the rest go. The ladies have motored and bridged and tea-ed; there has been golfing and dancing, not to mention eating and drinking; there has been climbing in and out of digging clothes, traveling clothes, and dinner clothes; always there has been a train to catch or a bus to catch, and seldom has anyone had time to see all that he would have liked to see at any one place. Getting even a kaleidoscopic impression of the mining industry of northern Ontario in four days and three nights, and partaking of the hospitality of the operators the while, is a strenuously hectic or a hectically strenuous task; and it is not to be wondered that the Congress is a little dizzy.

Ontario Fulfills Promises Made for It

The reason for the feeling of pleasure is that Ontario more than lived up to the promises made for it in Montreal and Toronto. I have talked to a large number who had never been in Canada before, and the impression I gain is that most of them were favorably surprised. They had heard of the Hollinger, of course, but they had not seen in their mental picture so large an enterprise, nor one so splendidly equipped from the bottom of the mine to the new refinery—which incidentally is the last word in the treatment of gold-cyanide precipitate. As to the other mines—the gold mines in particular—there was no very clear conception in the eyes of many of the visitors. To put it mildly, they were astonished at what they saw. The new McIntyre shaft and hoisting installation won praise and admiration from engineers from all over the world. Another eye-opener to most was the type of new cyanide plant as represented by the latest addition to Teck-Hughes treatment plant, and by the smaller but equally substantial and modern installation at the Sylvanite property. Indeed, Kirkland Lake as a whole created an especially favorable impression.

After the deluge of oratory by officials and others in the "big cities" down south, the attitude of the mine operators was particularly pleasing to the visitors. Nobody asked for money to finance further expansion of the industry; nobody expatiated on what the present production of Ontario is, or what it will be; nobody boasted about what he was doing. The mine managers and their assistants said in effect: "Here is what we have; look it over. If there are any questions that you want to ask, we will try to answer them. If you can suggest any way that we can improve on what we are doing we will be glad to listen." And in spite of the brevity of the visits at the various plants a lot of valuable information was obtained, judging from the multitude of questions that were asked and answered and the notes that were taken by the visitors in the short period available at each property.

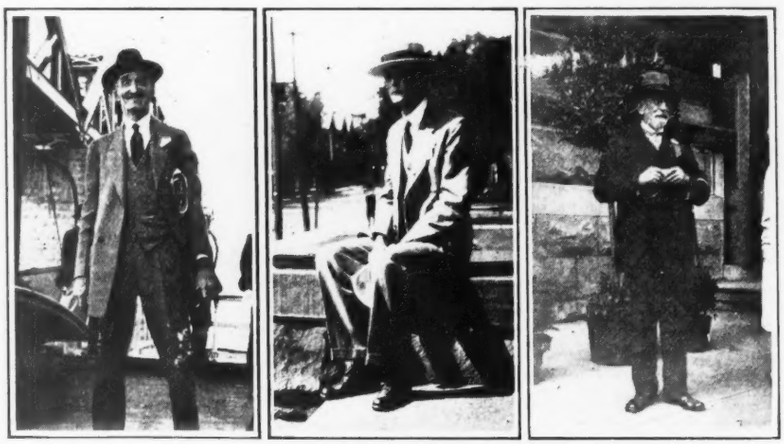
Besides extending mental hospitality, the operators outdid themselves in hospitality of other kinds. No one had a chance to walk anywhere that an automobile could go. Buses, company cars, and private automobiles seemed to be waiting everywhere at the command of the members of the Congress. Shoe leather was more precious than automobile tires. At Kirkland Lake the Wright-Hargreaves, Lake Shore, Teck-Hughes, and Kirkland Lake Gold companies each entertained at luncheon. Indicative of the sumptuousness of each of these repasts is the fact that every guest sympathized with the unfortunate ones who had partaken of hospitality other than that enjoyed by himself and his group.

Anyone suffering from thirst had only to cough a few times and he was directed to a place where liquid refreshment of various kinds was available to allay his needs or desires. At the ball given by the mine managers of the Porcupine area the punch bowls were conspicuously labeled with printed signs, one reading "With," the other, "Without." During the course of the evening someone transposed the signs, but no serious consequences were reported.

Porcupine Mine Managers Give Ball

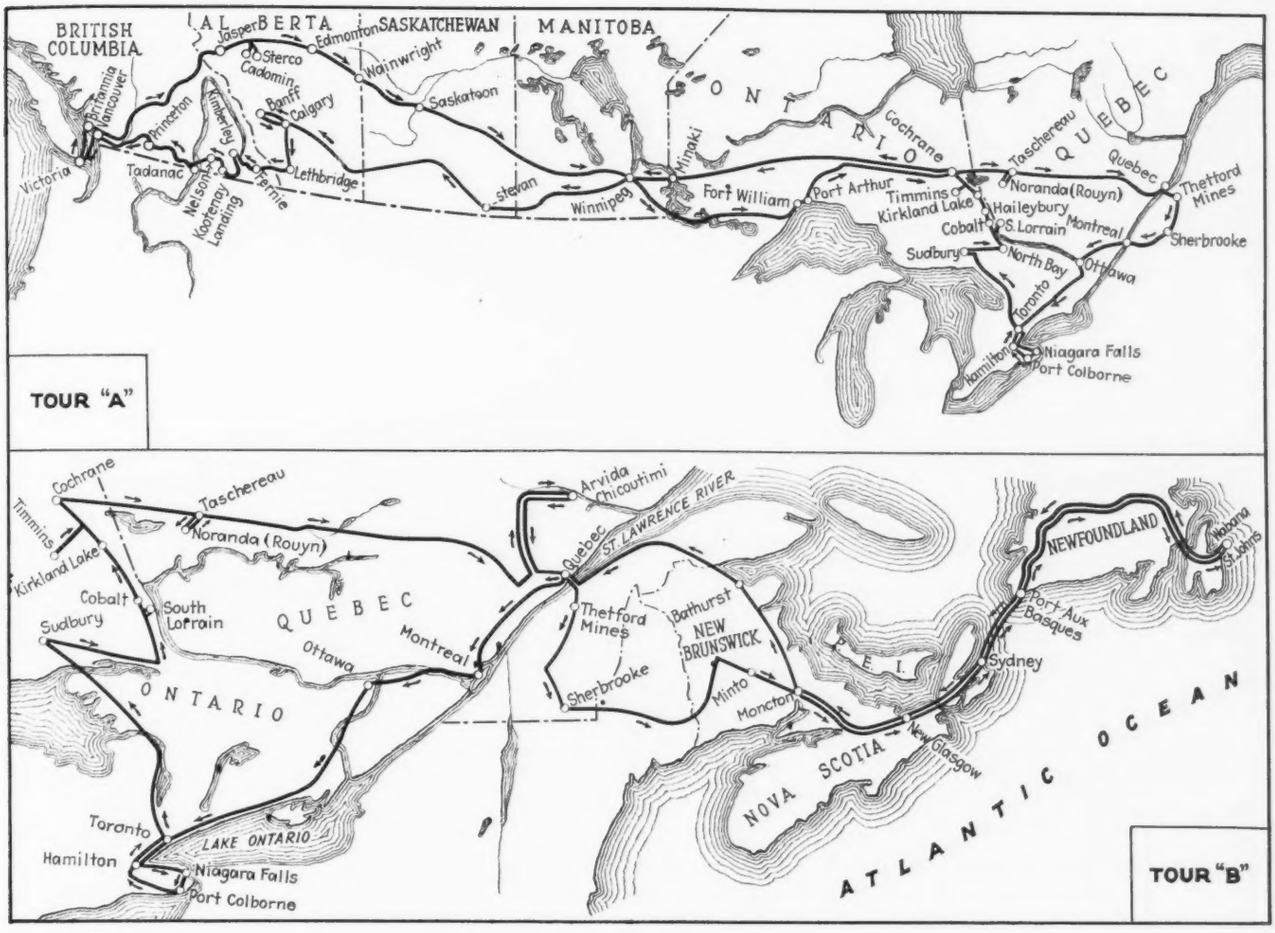
This ball, the crowning social event of the stay in northern Ontario, was held in the skating rink. At the cost of 1,000 "quid"—so I am told—a special floor composed of new mine-shaft lagging was laid and surfaced in place. After serving its purpose quite satisfactorily for one night it was torn up the next day to be used in the Hollinger shaft. A feature of the evening was a program by Ukrainian entertainers, colorfully garbed in costumes of their native country. One group of dancers was composed of children ranging from six to fourteen years of age, the sons and daughters of workers in the Porcupine mines. Another hit was a sword dance by sixteen men who are regularly employed in the mines; and still another was provided by the Ukrainian Girls' Mandolin Orchestra from Winnipeg, which played and sang in professional style. The Gravevard Shift Syncopators [illegible] the dance music, though the significance of their name, painted on a large banner behind them, was lost on some of the visiting dancers. The musicians did not quite complete the shift!

It should be remarked that the townspeople of Timmins were not entirely unrewarded for their efforts in behalf



F. Lynwood Garrison *H. Foster Bain* *R. M. Catlin*

Official A.I.M.E. representatives attending the Congress



Map showing routes of the two tours.

of the visitors. They got quite a thrill out of the arrival of the Congress trains, shortly before 9 on Wednesday night. Picture a small town at the end of a branch line of the railroad, that sees about two regular passenger trains daily. Picture three long brilliantly lighted trains of Pullmans, each with an observation car, pulling into the station out of the darkness. And from these trains swarm a couple of hundred people in evening clothes, for the hour of the dance is near at hand. Apparently the entire town has constituted itself a committee of welcome, and the attitude of most of them is reflected in the remark overheard from a girl in her 'teens who said, "This is sure the greatest show that ever came to Timmins."

From the point of view of the Congress it may be said safely, as the trains speed toward Manitoba, that the visit to northern Ontario was a success in every way. They came, they saw, and they were conquered.

International Nickel Refinery Proves Attraction

I can only touch briefly a few of the high spots of the trip since I dropped the chronological narrative in Toronto a week ago. Soon after noon on Friday the trains left Toronto bound for Niagara Falls, with a stop on the way at the plant of the Steel Company of Canada, at Hamilton. The Falls lived up to their reputation as a spectacle, though they were viewed only by electric light, and the return journey was started at midnight. The principal attraction on the way back was the refinery of the International Nickel Co. at Port Colborne. J. L. Agnew, president of the company, greeted the visitors, after which they were conducted through the plant. Interest centered in the new process for making anodes, of which one unit is now in operation. The nickel "bottoms" from the blast-furnace settling pots, instead of being leached and roasted to convert them into black oxide, are crushed and roasted directly on a Dwight-Lloyd machine. The roast is ground, mixed with coal dust, and reduced in a reverberatory furnace, from which anodes are cast. To electrolyze these impure anodes it is necessary to resort to the use of the anode frame with a canvas diaphram as in the Hybinette process, and to purify the anode solution. This is done by heating it and agitating it with impure nickel dust in a series of modified Pachuca tanks. The sludge from the "primary" anodes is remelted and cast into "secondary" anodes. Sludge from these anodes, now concentrated, is collected in containing bags instead of being allowed to settle in the bottom of the tank, and is treated for the recovery of the precious metals. The electrolyte contains 40 grams of nickel and 0.00032 gram of sulphuric acid per liter; and the current density is 10.9. To produce at the rate of 750,000 lb. of nickel per month 47,000 amp. is required. Eventually the entire output will be produced electrolytically.

Several novel features have been introduced in the treatment of the sludge for the precious metals. The copper is first dissolved with sulphuric acid. The residue, after being evaporated nearly to dryness with aqua regia, is taken up with ammonia and the platinum is precipitated as a double platinic chloride with ammonium chloride. All precipitate is reduced to pure sponge platinum. Palladium is next precipitated electrolytically as a clean crystalline coating that is stripped from the cathode.

Creighton Mine at Sudbury Visited

After a quiet Sunday in Toronto the party entrained for Sudbury, arriving early in the morning. At the Creighton mine of the International Nickel Co., J. C. Nicholls, manager of the mining and smelting divisions; E. A. Collins, assistant manager, and William Rolfe, mine superintendent, headed the party that entertained the Congress. A four-compartment shaft inclined at about 70 deg. parallels the vein in the footwall, the bottom now being at about 3,000 ft. on the incline. A lens of massive sulphide, 150 ft. thick in places, is mined by shrinkage stoping; 50-ft. pillars are left, but are later mined, so that the extrac-

tion is 100 per cent. Of the 90,000 tons hoisted monthly about one-third is discarded as waste by means of magnetic pulleys and hand picking. At the smelter, several miles away at Copper Cliff, Donald MacAskill is superintendent and Richard Coleman is metallurgist. Although no official statement is forthcoming, it is generally understood that the blast furnaces will not long survive at this plant. Coke costs about $16 per ton and coal suitable for pulverizing can be obtained for about $6. Four wedge roasters fired with pulverized coal give a sulphur elimination of about 50 per cent and supply the single furnace that comprises the present reverberatory plant. The charge is a mixture of raw and roasted ore in the proportion of about 1 to 2. One big project now under way is the sinking of a new five-compartment shaft, 3,000 ft. deep, at the Frood mine of the International company. It is being sunk vertically in the footwall, in spite of the fact that the vein dips about 60 deg., and a crosscut half a mile long will be necessary to reach the ore on the lower levels. This indicates that considerable trouble has been experienced in the maintenance of the inclined shaft at the Creighton.

As in the case of the International, the Mond Nickel Co. produces only nickel-copper converter matte in the Sudbury district. This matte, assaying 82 per cent combined nickel and copper, is shipped in the case of the Mond company to Wales for refining. Only blast furnaces are used at the Wales smelter at Coniston, the fine ore being sintered, along with the output of a 300-ton concentrator. The company finds that it is more profitable to mine and concentrate the lower-grade ores than to leave them in the mine. Another activity is the operation of a sulphuric acid plant, utilizing the gases from the converters to make 50 tons of 66 deg. acid per day, by the contact process. This is a new, but a highly profitable, venture. K. S. Clarke, superintendent of the concentrating and sintering plants, headed the party that guided the Congress around the plant. A crowd of small boys, who seemed to have limitless supplies, served tea and coffee and excellent chocolate cake in the acid plant. A large party visited the company's Garson mine, one of the four operated by it in the district.

The Mond and International companies are the only producers of consequential quantities of nickel in America. During the first half of 1927 they output together at the annual rate of 80,000,000 lb. of nickel, 11,000 oz. of platinum, and 10,000 oz. of palladium.

Cobalt Is Reached

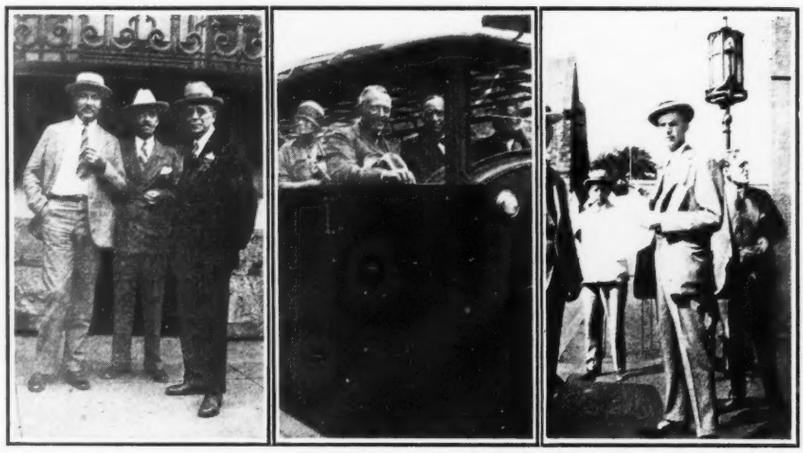
Tuesday morning found the Congress at Cobalt, a camp that has, since 1905, produced about 350,000,000 oz. of silver. Its glory has been fading in recent years, owing to the gradual exhaustion of the orebodies, and it has suffered recently from the decline in the price of silver. Whereas in 1910 and a few subsequent years the annual output was close to 30,000,000 oz., it is now at the rate of about 2,400,000, with 1,300,000 from the neighboring district of South Lorrain. A special train took the members of the Congress to South Lorrain, where the Keeley mine was the principal attraction. Some remarkable specimens were on exhibit, one being a slab of native silver weighing 140 lb. and worth about $900. The company in addition to its high-grade shipments is making about two tons per day of concentrate from 35 oz. ore. Tables and a small flotation unit effect a recovery of 87 per cent of the silver. M. C. H. Little, resident manager, and Donald McGillis, mill superintendent, were on hand to show the guests over the property.

Inspect Hydraulic Air Compressor Plant

On the way back to Cobalt a halt was made at Ragged Chutes to permit an inspection of the Taylor hydraulic air-compressor plant which generates the equivalent of 5,500 hp. in the form of compressed air at 125-lb. pressure. This is delivered to the mines at Cobalt through a 20-in. main. Air is entrained in water at the surface in 132 vertical pipes, 14 in. in diameter. The impregnated water descends through two pipes, 8 ft. 6 in. in diameter, in a vertical shaft sunk to a depth of 350 ft. Here, in a horizontal chamber 1,021 ft. long, the air is liberated, and at the high point of the roof of the tunnel it enters the compressed-air main. The water, after surrendering the trapped air, emerges through a vertical shaft rising to a level 48 ft. below the elevation of the top of the intake shaft.

On the return to Cobalt visits were made to the concentrator of the Cobalt Reduction Co., the O'Brien mine and mill, and the reduction works of the Nipissing Mining Co., where concentrates are cyanided to produce bullion 999 fine and a residue containing cobalt, nickel, and arsenic. The arsenic is shipped. All roads finally led via automobile to the golf club at Haileybury, where indoor hospitality was dispensed bounteously. A dance in the evening at the club-house finished the day, the trains leaving at midnight for Kirkland Lake.

Next week I hope to review some of the feature of the visits to the Kirkland and Porcupine districts.



Left—F. W. Foote, F. L. Tierney and L. D. Huntoon. Center—Scott Turner and J. H. Steinmesch. Right—G. C. Mackenzie, general secretary of the Congress.

At the Congress

This and That

One prominent English engineer answers the plea of the Canadians for financial help something like this: "We are not broke even though we may not be as well supplied with funds as we would like. However, if they will show us something good we'll find the money to buy quickly enough." He does not want to be quoted, but his feeling is that the English frequently have been offered the second-rate stuff.

* * *

Major George C. Riley, chairman of the main committee, says that the total registration has been in excess of 625. Of these there have been casualties and replacements along the road, with the net result that 380 will participate in the major portion of either the "A" tour to the Pacific Coast, or the "B" tour through the eastern provinces and Newfoundland. Of these only about 40 will go eastward on Tour "B."

* * *

Mrs. George A. Guess, of Toronto, made her first and, she avers in no uncertain terms, her last venture down a mine shaft at the Creighton mine of the International Nickel Co. With the closing of the guillotine-like gate of the inclined man-car carrying twenty people, she decided not to make the trip, but it was too late. She says now that she will never again get into a similar trap.

* * *

After the third formal affair on successive evenings, F. W. Foote, of New York, remarked that unless the laundries of Toronto had a seventy-four hour service he would turn up missing at the next boiled-shirt function.

Personal Notes

V. GRINDLEY FERRIS, consulting mining engineer, of Johannesburg, is in England.

J. WHITEHOUSE, consulting mining engineer, of the Corner House staff, at Johannesburg, is on a visit to Rhodesia.

H. WARRINGTON SMYTH, Secretary for Mines and Industries in South Africa for the last twenty-five years, is retiring. He is now in England.

FOREST MATHEZ, consulting engineer, has returned to Salt Lake City after putting a crew to work at the Mono Mining Co. property, near Sweetwater, Calif.

C. B. BRODIGAN has resigned the general managership of the Brakpan Mines and has received an appointment on the London staff of the Anglo-American group.

A. P. NELLMAPIUS, who has been for some years on the staff of the Central Mining & Investment Corporation, will soon retire to take up private practice as a mining engineer.

Colonel J. P. GRENFELL, chairman of the Messina Development Co., has left Capetown for Johannesburg, en route to the company's copper mine in Northern Transvaal.

J. B. TYRRELL, vice-president and managing director of the Kirkland Lake Gold Mining Co., has returned from a motor trip to the company's mine at Kirkland Lake.

GEORGE C. KLUG, past president of the Australasian Institute of Mining and Metallurgical Engineers, and a resident of Melbourne, recently made an inspection of the local property of the Anaconda Copper Mining Co.

CHARLES SPEARMAN, consulting mining engineer, is making an examination of the McCarthy Webb property in the Goudreau area of northern Ontario and arranging a program for an extensive development campaign.

Prof. A. L. WALKER, of the metallurgical department of Columbia University, was a recent visitor at the Old Dominion mine in Globe, Ariz. Professor Walker was superintendent of the property thirty years ago.

Dr. A. L. HALL, of the Union Geological Survey, and A. DE SMIDT, Inspector of Mines, recently made an official tour, through the Warmbaths and Nylstoon district of South Africa.

PERCY E. HOLME recently resigned as general superintendent of the El Oro Mining & Railway Co., Ltd., of El Oro, Mexico, to accept the position of assistant manager of the Patiño Mines & Enterprises Consolidated, Inc., of Llallagua, Bolivia.

JOSEPH D. GRANT, of San Francisco, first vice-president of the Columbia Steel Corporation, was elected to the office of president made vacant by the recent death of Wiggington Creed. D. H. BOTCHFORD was elected first vice-president and general manager.

GEORGE St. J. PERROTT has been appointed superintendent of the Pittsburgh experiment station of the U.S. Bureau of Mines, succeeding A. C. Fieldner, who was recently placed in charge of all of the Bureau's experiment stations. He was commissioned as first lieutenant in the Chemical Warfare Service early in 1918. At the end of the war, Mr. Perrott returned to Pittsburgh, where he conducted an investigation of the carbon black industry. In the fall of 1919 he was appointed chemist with the commission which investigated the possibilities of smoke abatement in Salt Lake City. During 1920-1923, at the Pittsburgh experiment station and the Southern experiment station, Tuscaloosa, Ala., he investigated problems in connection with the cleaning of coal and the properties of metallurgical coke. In 1923 he was assigned to investigate the properties of liquid oxygen explosives at the explosives experiment station of the Bureau, Bruceton, Pa. The data so obtained were then applied by Mr. Perrott in mining operations at Leadville, Col., Cerro de Pasco, Peru, and Pachuca, Mexico. In August, 1925, after his return from Peru, he was appointed assistant chief explosives chemist, under Dr. Charles E. Munroe. In the fall of 1926 Mr. Perrott spent three months in Europe inspecting explosives experiment stations and laboratories working on explosives problems in England, France, Belgium and Germany. A program of co-operative research on explosives problems was drawn up with the Safety in Mines Research Board of Great Britain.

G. ST. J. PERROTT

Mr. Perrott is the author of a large number of papers published in the scientific and technical press.

Prof. CARL LAUSEN, of the United Verde company, Jerome, and late of the Bureau of Mines, Tucson, Ariz., accompanied by ANDREW MACFARLANE, of Phoenix, Ariz., is on a visit of examination to several mines in Sonora.

RALPH CRAWFORD, special agent for the Ingersoll Rand Co., is in the United States after a four-year stay in Japan. Mr. Crawford attended the A.I.M.E. meetings in Salt Lake City after visiting Butte, Mont. From Salt Lake he will go to Denver and New York.

A. H. EMERY has been appointed office assistant to A. C. Fieldner, the engineer in charge of the experiment stations of the U. S. Bureau of Mines. Mr. Emery is a mining engineer, a petrologist and a geologist. He has been engaged in technical research work at the Pittsburgh station of the Bureau for a number of years.

J. F. WELLBOURN, president of the Colorado Fuel & Iron Co., accompanied by J. B. MARKS, executive vice-president; E. H. WEITZEL, vice-president and general manager; W. A. MAXWELL, superintendent; and R. B. WEED, production manager, has been investigating corporation holdings of manganese and iron in the vicinity of Silver City, N. M.

CARLTON D. HULIN, who has during the last fourteen months made a detailed study of the geology of the Pachuca district, Mexico, and of the Sunnyside mine, located near Silverton, Colo., for the United States Smelting, Refining & Mining Co., is returning to his duties as assistant professor of geology at the University of California. Dr. Hulin expects to spend a portion of his time during the coming year in consulting work.

H. S. DENNY, C.B.E., a noted British mining expert and a representative of English interests extensively interested in Canadian mining, is now in Canada, looking after opportunities for investment. Mr. Denny, who is president of the Mentor Exploration & Development Co., Ltd., anticipates a large influx of British capital, and has arranged to remain in Canada for five years, directing operations on properties under his control. Dr. Denny, who was made a Commander of the British Empire for his services during the war, is a graduate of the Ballarat School of Mining in Australia, and has had a wide experience in that country and South Africa, where he was actively concerned in the introduction of improved metallurgical methods at the Rand mines.

OBITUARY

HENRY JOHN O'REILLY died recently in Pretoria, South Africa. He and his brother, the late Jack O'Reilly, were pioneers in the diamond industry. In March, 1867, they got a stone, from some children, which proved to be a valuable diamond. They were sons of Sir James O'Reilly, a magistrate in Cape Colony, and were among the first to recognize the potential value of diamonds in the Kimberley district.

Recent Technical Publications

THE RHODESIAN MANUAL for 1927. Edited by C. Carlyle-Gall. Published by Mining and Industrial Publications of Africa, Ltd., Empire House, St. Martins-le-Grand, London, E. C. 1. Price 21 shillings.

THIS book, a complete guide book to Rhodesia, is of particular interest to the mining man on account of the great detail with which the mining industry is covered. In addition to a historical review and an excellent chapter on the Constitution of Southern Rhodesia, there are chapters devoted to an extract from the Report of the Director of the Geological Survey, Gold Mining in Southern Rhodesia, Base Metals and Other Minerals of Southern Rhodesia, Platinum, and the Mining Laws of Southern and Northern Rhodesia. There is an excellent chapter of general information for prospective settlers.

Chapter X contains 135 pages and is a detailed directory of mines: output, names of staff, and board of directors, office address, and dividends paid—are given.

* * *

THE IRON ORES OF LAKE SUPERIOR. By Crowell and Murray, Inc., mining engineers, chemists and metallurgists, Cleveland, Ohio. Sixth edition. Pp. 365. Published by the Penton Press Co., Cleveland. Price $6.

A FIRST edition of this book was originally published in 1911. The present volume has been brought completely up to date. The early history and geology of the Lake Superior region, the mineralogy of the ores, and the methods of exploration in use, estimating ore reserves and mining the orebodies are treated. The authors likewise discuss the classification and sampling of Lake Superior iron ores and the laboratory methods adopted in their analysis. Chapter VII contains a wealth of statistical data, and the latter part of the book is devoted to special articles by M. C. Lake, C. P. McCormack, and others on the "Life of Lake Superior Ores," "Economics of Iron Ore Beneficiation," and kindred subjects. The book contains numerous maps.

* * *

THE CHROMIUM SITUATION FROM A DOMESTIC STANDPOINT. By J. W. Furness (Information Circular No. 6038. Published by the U. S. Bureau of Mines, June, 1927).

RAPID expansion of the chromium industry and the present and potential sources of chromium are discussed by the author in this résumé. After reviewing the physical properties of chromium, the general nature of chromite deposits, the metallurgy of chromium, and its uses, the author proceeds to deal with world consumption and production. In this section he has included a map showing the distribution of the chromite deposits of the world. He passes on to review the world resources. The largest deposits of chromite are those located in Rhodesia, New Caledonia, and Anatolia. It would seem that the reserves of the Rhodesian field alone are more than sufficient to supply the world's present demands for many years.

Reviewing the sources in the United States, the author points out that, judged by present commercial standards, the country has no chromite. He points out, however, that there are large reserves of low-grade, high-cost chromite and certain areas geologically favorable to its occurrence. This interesting pamphlet concludes with paragraphs on the domestic tariffs and marketing of chrome ore. E. G. LAWFORD.

* * *

GEOLOGY OF ALABAMA. By George I. Adams, Charles Butts, L. W. Stephenson, and Wythe Cooke. Special Report No. 14, Geological Survey of Alabama, University, Ala.

THIS 132-page report, with accompanying maps, is the fruition of several years' work in which the U. S. Geological Survey co-operated. A most creditable detailed geological map of the state is included, and the report constitutes an excellent well-illustrated outline of the salient features of Alabama geology.

* * *

THE IRON AND STEEL INDUSTRY. World Peace Foundation, 40 Mount Vernon St., Boston, Mass. Price, $1.

THIS book has been issued as part of the documentation of the International Economic Conference which began its sessions at Geneva on May 4. The document was prepared by the Economic and Financial Section of the League of Nations from information furnished to it by governments, by members of the Preparatory Committee for the Conference and by industrial organizations, which prepared memoranda at the request of members of the committee. The salient phases of the subject and its international aspects are examined from this mass of information, and the statistical tables and summaries, as a consequence, are most comprehensive, authentic, and up to date.

* * *

QUICKSILVER RESOURCES OF ARIZONA. By Carl Lausen and E. D. Gardner. Bulletin No. 122 of the Arizona Bureau of Mines, published by the University of Arizona, Tucson.

IN ADDITION to being a review of Arizona's reserves of mercury, this pamphlet, which is No. 29 of the Mineral Technology Series, contains valuable information on the mineralogy and metallurgical treatment of mercury ores. Some details are given on the metallurgical performances of the Scott furnace, and health hazards in the extraction of quicksilver are discussed. The authors deal with the geology of the more important mercury-producing localities of the state and consider, also, the economic possibilities of the known deposits.

MANGANESE AND FERROMANGANESE—In his paper "Manganese, the Ores and the Metal; With an Account of the History and Production of Ferro-Manganese," which he prepared for the British Iron and Steel Institute's annual meeting on May 5 last, Sir Robert Hadfield makes a contribution to manganese literature that is especially useful at the moment. In its ninety pages he gives a synopsis of the information available today regarding manganese and ferromanganese. He emphasizes the well-appreciated fact that the principal steel manufacturing countries are not known to have within their immediate borders adequate reserves of manganese ore of the grade at present used for making ferromanganese. He expresses the hope that his government will take such steps as are necessary to insure that the manganese requirements of the British steel industry could be met should war suddenly occur. In concluding he alludes to an old proverb, "They who own the iron of the world rule the world," and adds that they who own the manganese of the world seem to have largely in their hands the control of steel of satisfactory quality such as is now necessary to meet modern requirements.

ORE AT DEEP LEVELS IN THE CRIPPLE CREEK DISTRICT—In Technical Paper No. 13 of the A.I.M.E. G. F. Loughlin discusses the genesis, distribution, and local sources of ore in the Cripple Creek area from the point of view of the possible further productiveness of the district on the deep levels.

TREATMENT OF READ-ROSEBERY ORE AT ZEEHAN, TASMANIA—In the July 5 issue of *Chemical Engineering and Mining Review* (Melbourne, Australia) E. H. Fraser describes the differential flotation of lead zinc ores at Zeehan.

CANADA'S BASE METAL PRODUCTION—"Lead and Zinc in Canada" and "Canadian Copper and Its Production" are the titles of two papers by T. W. Bingay and F. J. Alcoen, and C. P. Browning, respectively, printed in the August bulletin of the Canadian Institute of Mining & Metallurgy, published by the Institute, 604 Drummond Building, Montreal.

TANGANYIKA TERRITORY—The annual report of the Geological Survey for 1926 gives an account of field work done during the year. This comprised water-supply investigations, reconnaissance surveys from Dodoma to Tringa, and examination of the gold-diamond region of Miwanza district. Printed by the Government Printer, Dar-es-Salaam.

USE OF BITUMINOUS SANDS FOR SURFACING HIGHWAYS—A treatise on the use of the bituminous sands of Alberta. It may be obtained from the Department of Mines, Ottawa. Price 20c.

RECENT PATENTS

CONTAINER FOR BLASTING CHARGES. No. 1,638,038. Aug. 9, 1927. Wellington E. Jenkins, Pittsburgh, Kan.

Design for a waterproof flexible container with a tubular neck.

PROCESS FOR RECOVERING VANADIUM FROM PETROLEUM HYDROCARBONS. No. 1,638,057. Aug. 9, 1927. Alfred Oberle, Kansas City, Mo., assignor of one-half to Thomas E. Scofield, Kansas City, Mo.

A process for recovering vanadium by combustion and collection of the deposited vanadium in an absorptive material.

PROCESS OF HARDENING COPPER. No. 1,638,076. Aug. 9, 1927. William H. Weiser, Dallas, Ore.

Process for hardening by injecting powdered magnesia into the molten copper.

ENDLESS-CHAIN EXCAVATOR BUCKET WITH DIGGING TEETH. No. 1,638,099. Aug. 9, 1927. Claude Rorabeck, Chicago Heights, Ill., assignor to American Manganese Steel Co.

Design for an excavator bucket.

RETORT FOR TREATING OIL SHALE. No. 1,638,217. Aug. 9. Edward B. Roth, St. Louis, Mo.

Design for a circular multi-hearth furnace, with rabble arms.

METHOD OF AND APPARATUS FOR SCREENING GRANULAR MATERIALS. No. 16,701. *Reissue*. Aug. 9th. Richard A. Leahy, Bonne Terre, Mo.

Vibrating screen design for which patent was originally granted May 22, 1922. No. 1,456,067.

CONCENTRATION OF TIN MINERALS. No. 1,638,279. Aug. 9, 1927. Walter O. Snelling, Allentown, Pa.

A process involving the conversion electrolytically of the surface of the cassiterite particles to metallic tin and subsequent separation of the particles from the gangue minerals.

APPARATUS FOR REDUCING ORES. No. 1,638,381. Aug. 9, 1927. Frederic Edward Witham, Halifax, England, deceased: by Abraham Reed, executor.

A design for a roasting furnace.

GRAVITY SEPARATOR AND PROCESS OF SEPARATION. No. 1,639,046. Aug. 16, 1927. Edgar O. Marty, Pottsville, Pa.

Design for an upward current separator in which a hollow head set in the receiving hopper forms an annular passage for the upward passage of the current. Heavy material is discharged at the bottom of the hopper and lighter particles are carried over the edge into a discharge launder.

PYROMETER. No. 1,639,534. Aug. 16, 1927. Samuel Ruben, New York.

A pyrometer working by means of a substance emitting light when heated and a substance whose conductivity is effected by light in the meter circuit.

METHOD OF MAKING ALLOYS. No. 1,639,330. Aug. 16, 1927. Jean H. L. de Bats, assignor to De Bats Metal Co., Bloomfield, N. J.

A method of making nickel-chromium alloys by placing upon the surface of the unmelted nickel metals of the chromium group in a finely divided condition, then raising the nickel to a temperature above its melting point but not above the melting point of the chromium group metals.

RECOVERY OF COPPER, ZINC, AND OTHER METALS FROM SOLUTIONS CONTAINING CHLORIDES AND SULPHATES. No 1,639,610. Aug. 16, 1927. Karl Mattenklodt and Hans Schramm, assignors to Duisburger - Kupferhutte, Duisburg, Germany.

Process in which copper is precipitated by zinc hydroxide-sodium sulphate separated from the solution, the remaining sulphur precipitated by addition of calcium chloride, and zinc hydroxide precipitated from the remaining solution by means of calcium hydroxide.

POWER SHOVEL. No. 1,639,752. Aug. 23. Leslie A. Russel, assignor to Koehrig Co., Milwaukee, Wis.

A new design for steam or electric shovels.

SAFETY BLASTING CAP. No. 1,639,906. Aug. 23. Newton I. Steers. Assignor to E. I. du Pont de Nemours and Co., Wilmington, Del.

An electric detonator having insulated leads, these leads being twisted together over a substantial portion of their total length.

ROCK DRILL EQUIPMENT. No. 1,640,082. Aug. 23. August H. Katterjohn, assignor to the Denver Rock Drill Co., Denver, Colo.

MINER'S HAND TOOL. No. 1,640,089. Aug. 23. Cornelius G. Murphy. Long Beach, Calif.

Design for crimping pliers.

JIB CRANE EXCAVATOR. No. 1,640,124. Aug. 23. Samuel King, Carlingford, New South Wales, Australia.

A power shovel having a jib carrying a ram which operates the dipper arm.

ALUMINO SOLDER. No. 1,640,161. Muraji Torii, Kamakuragori, Japan.

A solder containing 20 to 70 per cent zinc, 20 to 70 per cent tin, 5 to 35 per cent lead, 3 to 50 per cent cadmium, 1 to 5 per cent tin phosphide, 1 to 5 per cent magnesium.

CONCENTRATION OF ORES. No. 1,640,218. Aug 23. Ralph E. Sayre, New Rochelle, N.Y. Assignor to Metals Recovery Co., New York.

A flotation process using thiourethane.

BRAKE FOR MINE CARS AND OTHER VEHICLES. No. 1,640,474. Aug. 30, 1927. Audley Hart Stow, assignor to Enid S. White, Caldwell, N. J.

A brake operated by a horizontal hand lever fitted with an equalizer member of unequal lever arms.

REFINING LEAD. No. 1,640,486. Aug. 30, 1927. Philip W. Davis, Cambridge, Mass.

Metallurgical process which consists of exposing lead alloys in a molten condition to the action of litharge.

REFINING LEAD. No. 1,640,487. Aug. 30, 1927. Philip W. Davis, Cambridge, Mass.

A similar process.

PLACER MACHINE. No. 1,604,565. Aug. 30, 1927. Arthur Crisfield Dennis, Piedmont, Calif.

A washing machine similar to the ordinary gold washer, but fed by a special tipping bucket.

SMELTING FURNACE. No. 1,640,574. Aug. 30, 1927. Tannie Lewin, St. Lewis, Mo. Assignor of one-half to William Lewin, St. Louis, Mo.

A cylindrical smelting furnace with special detachable end extensions.

PROCESS FOR THE MANUFACTURE OF PURE BARIUM CARBONATE. No. 1,640,652. Aug. 30, 1927. Ferdinand Falco, Haspe, Germany.

A process for the manufacture of barium carbonate free of sulphur compounds, by the addition of volatile organic reducing agents to the barium carbonate produced by precipitating a solution of barium sulphide with carbon dioxide and at the same time passing some carbon dioxide into the mass and then heating the mass at high temperature.

PRODUCTION OF COMPLEX AUROTHIOSULPHATE COMPOUNDS. No. 1,640,775. Aug. 30, 1927. Einar Keiding, Birkerod and Johannes Keiding, Charlottenlunde, Denmark.

The process depends on the reaction between an auro-halide with the thiosulphate of an alkali forming metal in a solution containing some alcohol.

TURBINE AND ROTARY COMPRESSOR. No. 1,640,784. Aug. 30, 1927. Christian Lorenzen, Berlin, Germany, assignor to Lorenzen-Turbinen Aktiengesellschaft, Bern, Switzerland.

A compressor with axial intake and peripheral discharge.

METHOD OF CONTROLLING EVOLUTIONS OF ELEMENTAL SULPHUR. No. 1,640,837. Aug. 30, 1927. Gustav Newton Kirsebom, Salt Lake City, Utah, assignor to the United States Smelting, Refining & Mining Co., Portland, Me.

The employment of arsenic during sintering operations resulting in the formation of arsenious sulphide.

MOLD FOR CASTING METALS. No. 1,640,843. Aug. 30, 1927. Charles E. Magill, assignor to the Aluminum Company of America, Cleveland, Ohio.

A new type of sand mold.

GRINDING BALL AND PROCESS OF MAKING. No. 1,640,885. Aug. 30, 1927. Thomas S. Curtis, assignor to Pacific Southwest Trust & Savings Bank, Los Angeles.

A grinding ball made of pyrophyllite baked in high temperature.

METHOD OF TRANSFORMING TITANIUM DIOXIDE OR RUTILE AND THE PRODUCT THEREOF. No. 1,640,952. Aug. 30, 1927. Simon J. Lubowsky, Brooklyn. Assignor to Metal and Thermit Corporation, Carteret, N. J.

A process involving calcining the titanium dioxide with magnesium oxide to produce a soluble compound.

ROASTING FURNACE. No. 1,640,988. Aug. 30, 1927. Henry J. Hartley, Edward J. Fowler and Dudley Baird, assignors to the Nichols Copper Co., New York.

Design for a multiple hearth rotary shaft furnace.

Market and Financial News

Germany Produces Electrolytic Antimony

The Norddeutsche Affinerie, in Europe, is reported to be producing regularly electrolytic antimony in commercial quantities, and has appointed Charles Hardy, Inc., of New York City as its sales representative in the United States and Canada.

Following the electrolytic production of copper, aluminum, and zinc, antimony is undoubtedly the first of the minor metals to be produced in this manner. The recovery of antimony by electrolysis has opened up an entirely new field, as in this process the valuable metals contained in the ore, such as gold and silver, are recovered. At the same time antimony of a purity which it is difficult to duplicate by any other process of refining is produced. Most buyers of antimony are particular about the arsenic, bismuth, copper, and sulphur impurities, and by the electrolytic method of refining these impurities are reduced to traces or to such fractions of a percentage that they can do no harm to the ultimate product.

Electrolytic antimony shows a purity of minimum 99.70 per cent antimony, and is produced in notched ignots of about 60 lb. each, making it convenient for the users to break up such a quantity of antimony as they require for their mixtures.

Bombay Silver Imports Drop

Silver imports into India for the week ending Aug. 20 totaled 510,000 oz., compared with 640,000 oz. for the preceding week, according to recent cabled advices to the U.S. Department of Commerce from its Bombay office. The sources of the imports were: Durban, 60,000 oz.; London, 450,000 oz.

Canadian Cobalt Production Declines

Finally revised statistics on Canada's cobalt production show an output of this metal in 1926 of 664,778 lb., valued at $1,136,014, against 1,116,492 lb., valued at $2,328,517, in 1925, according to the mining branch of the Dominion Bureau of Statistics. This production figure includes the cobalt content of the various cobalt products sold by the south Ontario smelters and the cobalt content of the ores and residues exported for treatment in foreign smelters. The value given is the net amount received by the shippers.

The decline in production was caused by the introduction into the world's markets of cobalt from central Africa, where it occurs in association with copper, in the mines operated by the Union Minière du Haut-Katanga. This company now produces about 45 per cent of the world's cobalt output and the Canadian production makes up the remaining 55 per cent.

Imports and Exports of Ores and Metals in July 1926 and 1927

Compiled from U. S. Department of Commerce Records

In pounds unless otherwise stated

Imports

	July 1926	July 1927
Antimony—		
Ore, Gross weight	.....	203,000
Ore, Antimony content	.....	99,200
Liquated regulus or metal	2,867,960	1,956,514
Copper		
Ores, copper content	14,025,425	9,658,037
Concentrates, copper content	5,612,111	5,053,578
Regulus, coarse metal, cement copper	410,697	76,436
Imported from		
Spain	3,721,899	697,324
Canada	5,444,129	3,112,039
Mexico	2,477,334	2,118,883
Cuba	4,295,884	3,362,000
Chile	2,891,810	5,091,428
Peru	148,265	325,766
Other countries	1,068,912	80,611
Unrefined black, blister, converter copper in pigs, bars and other forms	38,457,972	37,398,475
Refined copper	10,522,276	7,922,402
Old and clippings for remanufacture	1,488,610	367,010
Composition metal, copper chief value	.....	.....
Brass		
Old and clippings for remanufacture	1,015,884	810,332
Lead		
Ore and matte	10,034,217	5,745,156
Bullion or base bullion	19,609,915	26,351,071
Pigs, bars and scrap	4,803,892	35,292
Babbitt, solder and other forms lead content	279,435	48,847
Type metal, antimonial lead, Gross weight	604,210	223,259
Type metal, antimonial lead, Lead content	412,786	169,369
Manganese		
Ore, tons, Cuba, manganese content	.....	.....
Ore, tons, Other countries, manganese content	34,133	27,948
Pyrites, tons	50,193	13,139
Tin—		
Ore, tons	8	
Bars, blocks, pigs	17,787,102	12,727,524
Imported from:		
Netherlands	1,795,516	1,064,271
United Kingdom	2,481,351	2,186,205
British Malaya	12,076,627	8,817,141
Dutch East Indies	949,152	.....
Hongkong	.....	196,533
Australia	235,200	133,200
Other countries	249,256	330,174
Zinc		
Ore, zinc content, Free	.....	.....
Ore, zinc content, Dutiable	2,054,162	.....
Blocks, pigs and old	2,087	2,205

Exports

	July 1926	July 1927
Copper		
Ores, composition, concentrates, unrefined	200 278	74,228
Refined copper in ingots and other forms	63,268,481	73,395,079
Exported to		
Belgium	6,379,858	6,516,393
France	7,398,536	11,876,218
Germany	11,840,770	16,682,498
Italy	5,588,783	8,099,574
Netherlands	6,116,055	7,782,435
Spain	268,818	213,022
Sweden	1,866,198	1,478,718
United Kingdom	15,091,085	11,824,007
Other Europe	4,390,580	493,022
Canada	1,957,367	998,101
British India	.....	3,836,582
China, Hongkong, Kwantung	513,345	1,032,560
Japan	1,343,922	2,199,522
Other countries	513,164	362,427
Old and scrap	1,099,404	3,272,012
Pipes and tubes	252,260	633,968
Plates and sheets	416,882	526,150
Rods	3,528,301	5,568,531
Wire	2,033,960	1,788,777
Insulated copper wire and cable	1,533,569	2,944,027
Lead		
In pigs, bars and other forms	15,323,829	26,975,993
From domestic ore	164,115	266,822
From foreign ore	15,159,714	26,709,171
Exported to:		
Belgium	448,166	670,211
France	1,669,127	1,232,473
Germany	2,856,603	8,436,281
Netherlands	168,074	683,327
Sweden	448,054	526,595
United Kingdom	4,259,839	8,525,701
Other Europe	.....	907,609
Brazil	224,048	224,001
Other South America	274,924	253,537
China, Hongkong, Kwantung	672,351	896,844
Japan	4,201,729	4,482,297
Other countries	100,914	137,117
Other lead manufactures	1,384,625	463,443
Zinc		
Ores and concentrates, tons	3,995	7,321
Dross	2,256,456	542,684
Cast in slabs, blocks, or pigs	11,590,054	11,363,973
Exported to:		
Belgium	280,033	56,000
France	.....	56,042
Germany	1,068,814	1,590,625
Italy	280,049	1,186,976
Netherlands	85,050	67,200
United Kingdom	6,292,724	4,413,573
Other Europe	123,199	291,262
Argentina	.....	1,887,929
British India	134,409	.....
Japan	3,304,364	1,455,162
Other countries	21,412	359,204
Sheets, strips, other forms	538,106	636,570
Dust	275,662	191,781
Other zinc manufactures	124,9106	484,436

The Market Report

Metal Sellers Watchfully Waiting As New Season Opens

New York, Sept. 7, 1927—Not much activity was expected in the non-ferrous metal market in the week ending today, what with the Labor Day holiday and all, so potential sellers were not particularly disappointed at the disinterestedness of consumers. Sales of all metals were in only fair volume, and well below current rates of production, but there is good reason to think that in the coming week much better business will be booked, particularly for copper, whose market has been much below average for several weeks.

Copper Situation Unchanged

Copper prices are again practically unchanged after another week, with only a small volume of trading. Most producers continue to offer the metal at 13¼c. delivered in the East and 13⅜c. in the Middle West, with only an occasional sale of a small lot, though a respectable tonnage was sold in the Middle West yesterday. On the other hand, custom smelters are sellers at as low as 13⅛c., and manage to get rid of enough to prevent their cutting prices further. The longer the large factors wait, the better their position will be, for scarcely any October copper has been bought, it would seem, and a fair amount of September requirements remain to be provided for. In several instances, it was requested that September copper be shipped in August, and most of the orders recently have been for prompt delivery, an unusual condition in the copper market. With one exception, refineries have very small stocks, particularly of certain shapes, and should a big rush come for early shipment, some buyers might be disappointed. The foreign market also continues quiet, with the c.i.f. price unchanged at 13½c.

Daily Prices of Metals

Sept.	Copper	Tin		Lead		Zinc
	Electrolytic, N. Y.	99 Per Cent	Straits	N. Y.	St. L.	St. L.
1	12 925	62 625	63 50	6.50	6.125@6.15	6.225–6.275
2	12 925	62 625	63 50	6 45@6 50	6.125	6.25@6 275
3	12.90	62.625	63.50	6.45@6.50	6 125	6 25
5	Holiday	.....	.....	.....	.....	.....
6	12.90@13 .05	62 875	63 75	6 40	6.10	6 25
7	12 925	62 875	64 00	6.375@6.40	6.10	6 25
	12 930	62 725	63 650	6 448	6.118	6 253

Average prices for calendar week ending Sept. 3, 1927, are: Copper 12.948; 99 per cent tin, 62.667; Straits, 63.563; N. Y. lead, 6.513; St. Louis lead, 6.146; zinc, 6.267; and silver, 54.667.

The above quotations are our appraisal of the major markets for domestic consumption based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

Copper, lead, and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

In the trade, copper prices usually are quoted on a delivered basis; i.e., delivered at consumer's plant. As delivery and interest charges vary with the destination, the figures shown above are net prices at refineries on the Atlantic seaboard. Delivered prices in New England average 0.225c. per pound above those quoted, and prices at so-called Middle West destinations, 0.325c. above.

Quotations for copper are for ordinary forms of wire bars, ingot bars, and cakes. For ingots an extra 0.05c. per pound is charged and there the other extras for other shapes. Cathodes are sold at a discount of 0.125c. per pound.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York is now quoted at 0.35c. per pound above St. Louis, this being the freight rate between the two points.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

London

Sept.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
1	54⅜	55¼	62	288½	284	22 7/16	22⅞	27¼	27⅜
2	54⅜	55¼	62	289	284½	22⅜	22⅞	27 5/16	27½
5	54⅜	55¼	62	289½	284¼	21⅞	22 7/16	27⅜	27 11/16
6	54 11/16	55¼	62	290	284½	22 1/16	22⅝	27½	27⅝
7	54 11/16	55 3/16	62	290½	284½	22	22 9/16	27 9/16	27⅝

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Sept.	Sterling Exchange "Checks"	Silver		Gold London	Sept.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
1	4.85⅝	54⅜	25⅛	84s10½d	5	Holiday	....	25⅜	84s11¼d
2	4.85⅝	54⅝	25 3/16	84s10½d	6	4 85⅝	54⅞	25 5/16	84s11½d
3	4.85⅝	54⅞	25 5/16	.....	7	4 85⅜	55	25⅜	84s11½d
					Avg.		54 750		

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command three-eighths cent premium.

Lead at 6.40c.

The lead market continues to decline, and consumers have displayed little or no interest during the week. Although there was a fair amount of business done on Sept. 1, the remaining days of the week entirely failed to produce any similar volume of dealings in the metal. One large seller is almost out of the market, but, notwithstanding this, prices declined perceptibly. On Sept. 6 the American Smelting & Refining Co. reduced its contract price from 6.50c. to 6.40c. New York, but even this price has been shaded. Apparently the market is feeling the lack of any concerted action on the part of lead producers throughout the world to restrict output.

Tin Steady

Tin has remained steady, but there has been little or no demand by consumers, sales having been mainly to dealers. Consumers seem to have their immediate requirements covered and to be awaiting a favorable break in the market. Should such a break occur, it is expected in some quarters that a fair volume of sales for future delivery would be registered.

Silver Firm and Higher

During the last week silver quotations have shown some improvement, advancing ¼d. in London and ⅝c. in New York. Inquiries from abroad are more encouraging, as both India and China are buyers at the present level. *Mexican Dollars* (Old Mexican pesos): Sept. 1st, 40⅞c.; 2d, 41⅛c.; 3d, 41⅜c.; 5th, holiday; 6th, 41⅜c.; 7th, 41½c.

Zinc Steady at 6¼c.

Another quiet week has passed in the zinc market, with most of the business placed at either 6¼c. or 6.275c., St. Louis. The proportion of carload business has been somewhat larger than usual, and most of the demand has been

for prompt or September shipment. Yesterday and today, the greater part of the business has been placed at 6¼c., though some are asking a little more. Small lots of High-Grade for spot shipment are nominally still at 8c., delivered in the East.

Foreign Currencies Unchanged

No important movements have taken place in the foreign exchange market. On Tuesday, Sept. 6, closing cable quotations on francs were 3.92c.; lire, 5.43¾c.; and marks, 23.78c. Canadian dollars, 1/32 per cent premium.

Other Metals

Quotations cover large wholesale lots unless otherwise specified. London prices are according to latest mail advices.

ALUMINUM—Per lb., 98 or 99 per cent grade, price of leading interest, 26c.; outside market, 25.30@25.80c.

ANTIMONY—Per lb., duty paid. New York: Chinese brands, range for the week, spot business, 11¾@11⅞c. October arrivals ⅛c. higher. Market quiet. Cookson's "C" grade, spot, 17¾c. Needle antimony nominally 8c. for lump and 10c. for powdered. White oxide, 16½c.

BISMUTH—Per lb., New York, in ton lots, $1.85@$2.10. London, 8s.

IRIDIUM—Per oz., $106@$110 for 98@99 per cent sponge and powder. Market dull.

NICKEL—Per lb. ingot, 35c.; shot, 36c.; electrolytic, 39c. (99.75 per cent grade) for single lots of spot metal.

PALLADIUM—Per oz., $52@$54. Small lots bring up to $58. Market dull and prices nominal. Pure metal as a constituent of crude platinum, nominal.

PLATINUM—Official price quoted by the leading interest on small miscellaneous orders for refined metal, per oz., $72. Dealers and refiners quote the trade for refined metal, per oz., cash, $64.50@$66.

QUICKSILVER—Per 76-lb. flask, range for week $118½@119½, nominal. Market shows little life. San Francisco wires $121.33. London, £21¾@£22.

Prices of Cadmium, Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten, and Zirconium are unchanged from the issue of Sept. 3.

Metallic Ores

MANGANESE ORE—Per long ton unit of Mn. c.i.f. North Atlantic ports, minimum 47 per cent Mn. 36@38c. Caucasian, washed, 53@55 per cent, 40c. Chemical grades unchanged from quotations in the Sept. 3 issue.

TUNGSTEN ORE—Per unit of WO_3, N. Y.: Wolframite, $10.10@$10.25. Western scheelite, $10.50@$10.75. Market dull and prices largely nominal.

Chrome, Iron, Molybdenum, Tantalum, Titanium, Uranium, and Vanadium Ores are unchanged from quotations in the Sept. 3 issue.

Zinc Ore Unchanged; Lead Lower

Joplin, Mo., Sept. 3, 1927

Blende

		Per Ton
High		$45.00
Premium, basis 60 per cent zinc	$43.00@	44.00
Prime Western, basis 60 per cent zinc		42.00
Fines and slimes, basis 60 per cent zinc	38.00@	41.00
Average settling price, all zinc		41.07

Galena

High	$88.90
Basis 80 per cent lead	82.50
Average settling price, all lead	86.16

Shipments for the week: Blende, 13,835; lead, 2,810 tons. Value, all ores the week, $810,440.

The shipments dropped 2,600 tons below those of the previous week, and with an increased production stocks were enlarged, but heavy selling today places the bulk of the stock in bins under the ownership of the buyers. Less than a week's supply remains unsold.

Nominal quotations on lead today are $82.50, basis 80 per cent lead, but unquestionable statements from the field report sales in midweek on a basis of $83.50, and a few sales were effected earlier on an $87.50 basis.

Platteville, Wis., Sept. 3, 1927

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$44.75

Lead Ore	
Lead, basis 80 per cent lead	$82.50

Shipments for the week: Blende, 1,209 tons; lead, none. Shipment for the year: Blende, 45,232; lead, 1,210 tons. Shipments for the week to separating plants, 1,950 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Borax, Celestite, Chalk, China Clay, Diatomite, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Greensand, Gypsum, Iron Oxide, Lepidolite, Limestone, Magnesite, Mica, Monazite, Ocher, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystal, Silica, Spodumene, Sulphur, Talc, Tripoli, and Zircon are unchanged from prices in the Sept. 3 issue.

Mineral Products

ARSENIOUS OXIDE (White Arsenic)—Per lb., 4c. Fair buying. London, Cornish white, per long ton, £17@£17½.

Calcium Molybdate, Copper Sulphate, Sodium Sulphate (Salt Cake), Sodium Nitrate, and Zinc Oxide are unchanged from prices in the Sept. 3 issue.

Ferro-Alloys

FERROMANGANESE—Per long ton, domestic and foreign, 78@82 per cent, $90, f.o.b. furnace, for delivery during second half 1927. Spiegeleisen, 19@21 per cent, $33@$35 f.o.b. furnace.

FERROTUNGSTEN—Per lb. of W contained, 75@80 per cent, 93@96c. f.o.b. works. Dull.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrophosphorus, Ferrosilicon, Ferrotitanium, and Ferrovanadium are unchanged from prices in the Sept. 3 issue.

Metal Products

ROLLED COPPER—Per lb., f.o.b. mill, sheets, 22c.; wire, 15¼c.

Lead Sheets, Nickel Silver, Yellow Metal, and Zinc Sheets unchanged from prices in Sept. 3 issue.

Refractories

Chrome Brick, Fireclay Brick, Magnesite Brick, Silica Brick and Zirkite are unchanged from quotations in the Sept. 3 issue.

Steel and Iron Quiet

Pittsburgh, Sept. 6, 1927

Steel ingot production in August was approximately 3,500,000 tons, representing no more than a trifling increase over the July rate, and 15 per cent under the rate in the first half of 1927. It was also 15 per cent under the rate of August, 1926. No more than a slight increase seems probable for this month. Increase in steel demand is predicted for later in the year, on general principles and not on account of important steel-consuming lines having better prospects. Toward the close of the year seasonal decreases are usually to be expected.

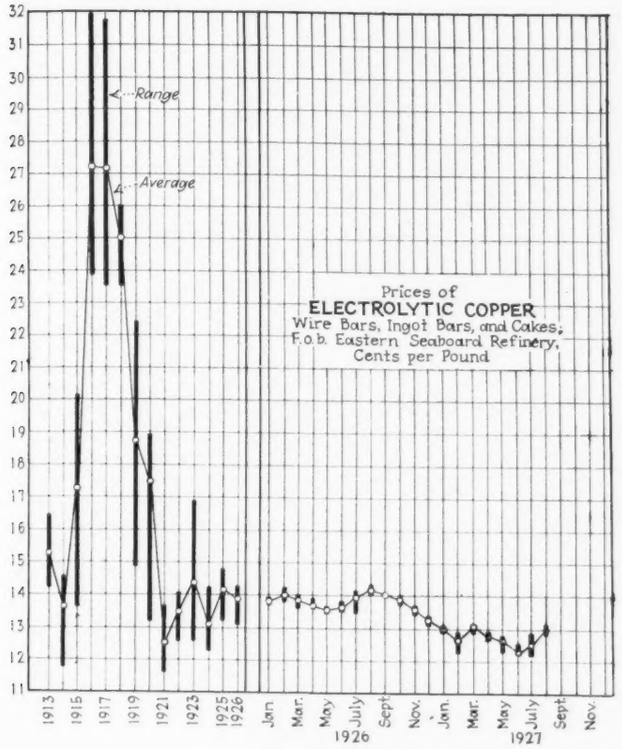
The automobile industry, except for the absence of Ford as a producer, is running very well. Freight-car and locomotive building is at a low ebb, with no prospect of any large orders. Supplementary rail buying has amounted to very little, and the annual rail-buying movement is soon due, chiefly for deliveries in the first half of 1928. Oil- and gas-well drilling continues light, with no prospect of increase in the remainder of the season. The agricultural-implement industry is running at slightly lower rate than a year ago. Fabricated structural steel bookings were very heavy in July and August, making the totals to Sept. 1 several per cent above those in the same period last year.

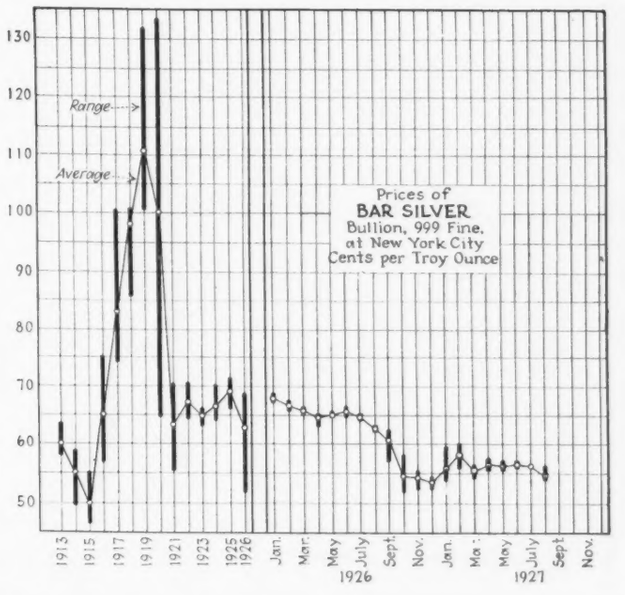
Finished-steel prices are not quotably changed, but there is a little disposition to slip. Single carloads of bars, shapes, and plates go at $1.80, endangering this price as to large lots. There are some slight irregularities in sheet prices.

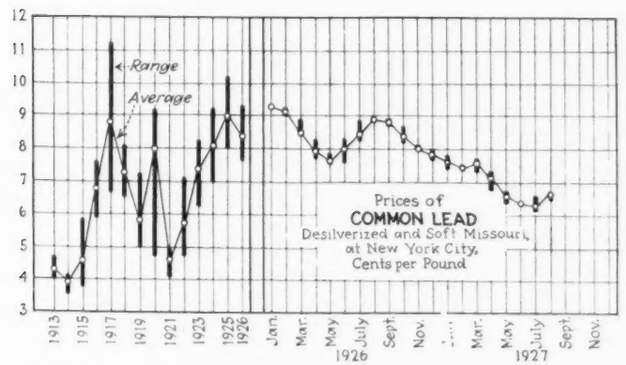
Pig Iron—Bessemer has slipped off 50c., to $18, Valley. Basic remains nominal at $17.25, Valley. Foundry remains $17.50, Valley.

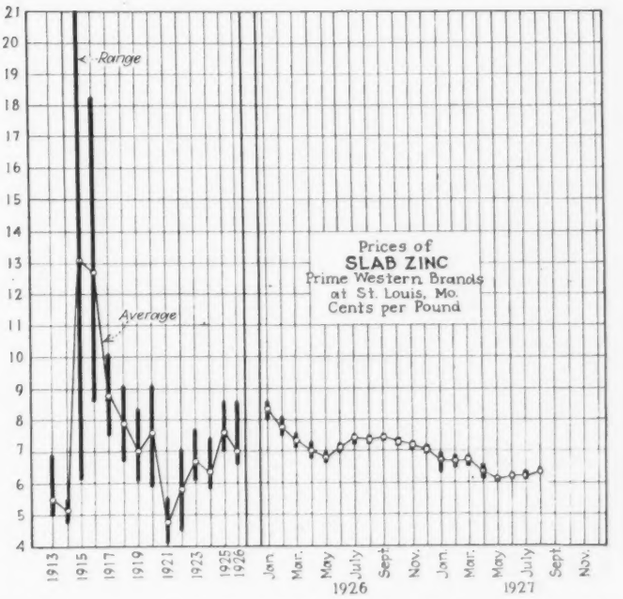
Connellsville Coke—Heating coke grows more active, furnace and foundry remaining at $3@$3.25 and $4@$4.75 respectively.

Metal Price Curves

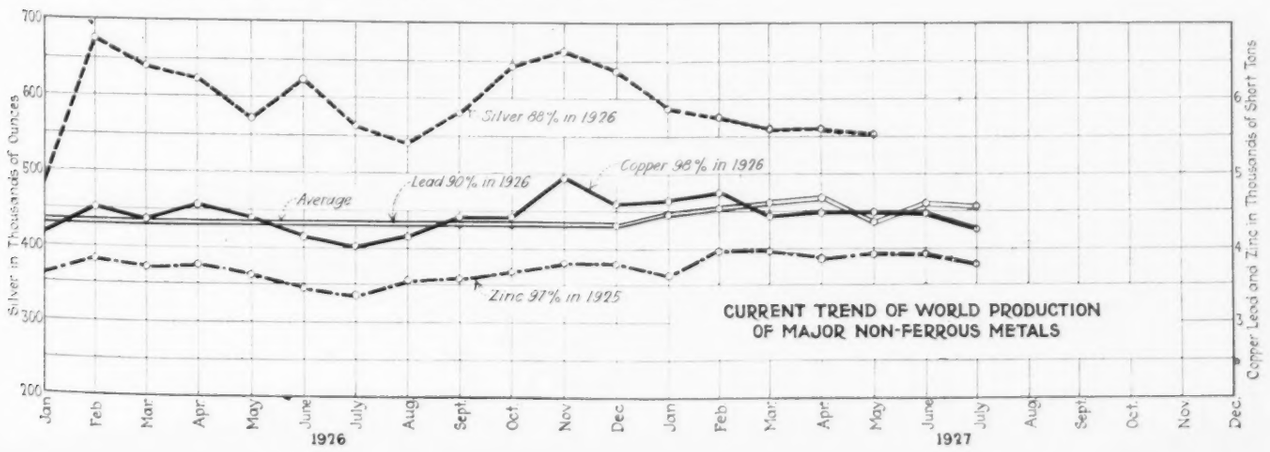








THE CURVES below are not to be considered as permanent records of production. They show merely the current trend in terms of daily output according to the latest estimates of the American Bureau of Metal Statistics. The figures represent production from countries that produce approximately 98 per cent of the world's copper, 97 per cent of the zinc, 90 per cent of the lead, and 88 per cent of the silver. The figures for lead on the new basis are not available for the individual months of 1926; and accordingly a horizontal line showing the monthly average reduced to a daily rate is shown. Delay in receipt of statistics from Mexico accounts for the failure of the silver curve to be up to date.



Review of Current Statistics

THE late summer and early fall months seem to be favorable for advancing metal prices, judging by the course of the market in the last three years. August seems to have been a particularly strong month in 1925 and 1926, and that just passed has been no exception. After an almost continuous decline since about this time last year, the *E. & M. J.* Weighted Index of Non-Ferrous Metal Prices shows a definite turn for the better, as was forecast in last month's review in these columns. Copper, lead, tin, and zinc all shared in the advance. The index figure thus reacted up to 97.25, compared with 95.42 the month before, and is the highest level reached since last April.

Followers of the metal industry are earnestly asking themselves if the reaction is to be only a temporary one or if the price advance is likely to continue. In studying the answer to this, several factors may be considered. In the first place, price indices of general commodities have advanced and are continuing to advance, strength being especially evident among the commodities sensitive to business developments. The commodity price index of the Harvard Economic Service, for example, was 143.3 for the week ending Aug. 31, after having been well below 140 a few weeks ago. This indicates that the metals are following the general trend and not flashing off by themselves, and is a favorable argument. Also, it has been the experience that when metal prices turn upward or downward, the new trend is likely to persist for several months. With as sharp a change as has occurred, however, a slight though temporary reaction is not unusual.

At the time of writing, Sept. 6, copper, tin, and silver are selling for just about the August average price, with lead and zinc slightly lower, having suffered a little reaction. However, with the vacation season just over, and a few quiet weeks behind, a generally brisk metal market is expected during the middle or last half of September, so the index for the current month may well advance further, with the outlook for general business in the coming months so favorable.

Copper producers have shown little weakening after three or four unusually quiet weeks, and the statistics seem to give them good grounds for maintaining their attitude. The cut in the rate of world production is distinctly encouraging, the July rate being 4,280 tons a day, compared with 4,475 tons in June. The July rate was the lowest since August of 1926.

Zinc sales continued normal in volume during August even at the slightly higher prices prevailing, which made the August average price the highest since March. In the case of lead, although the average price for the month registers a small increase, there is no denying the fact that the last two weeks of August witnessed a marked decline, and since there has been only a slight decrease in production, compared with the more considerable decline in the output of copper and zinc, no very great optimism can be entertained for the future in regard to this metal.

Although the world production of lead has slightly declined, there was an increased domestic and Mexican production during the month. It is noticeable that there has been a very marked increase in imports, which reached the highest figure attained since July, 1926.

E.&M.J. Weighted Index of Non-Ferrous Metal Prices

100 Is Composite for 1922-3-4

1920	130.92
1921	80.80
1922	93.94
1923	103.43
1924	102.63
1925	111.74
1926	107.74

	1925	1926	1927
January	116.38	112.66	100.46
February	113.50	111.91	100.01
March	110.20	108.95	100.84
April	104.75	105.93	98.63
May	105.34	105.43	96.41
June	107.19	106.68	95.55
July	108.81	109.08	95.42
August	113.61	110.22	97.25
Average first eight months	109.97	108.86	98.07

The figure of 17,737 tons means a considerable tonnage of ore lead coming into the country, and there is no question that the lower prices of lead which have so consistently prevailed in London of late are thus diverting much foreign-mined lead to this country, that formerly was absorbed abroad. This should take some of the pressure off the London market, at least.

Stocks at the end of July were 5,000 tons less than at the beginning of the month, a fact which may well indicate that there is no need to take an over-pessimistic view. Copper stocks remained at practically the same figure at the beginning and end of the month while there was a decrease of 4,500 tons in the stocks of zinc. Silver has declined, but the relative unimportance of this metal in the group is shown by the fact that its decline in price has not offset the upward trend of the remaining metals of the group in relation to the weighted figure.

The weighted index in the non-metallic group has also increased owing to a rise in the price of asbestos.

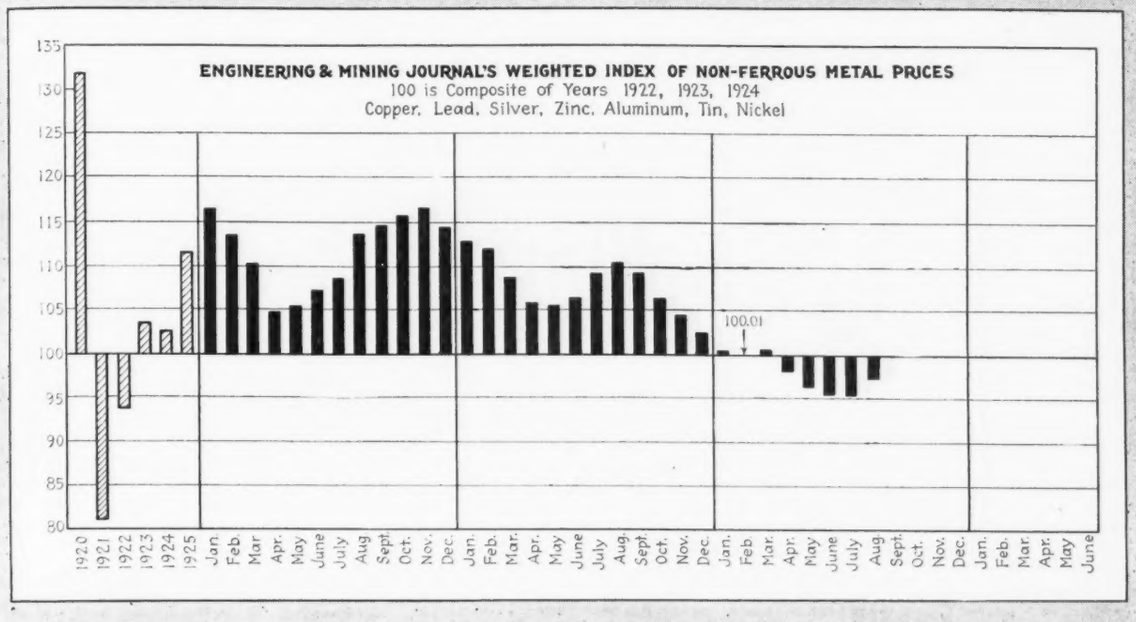
The weighted indices of stock-market valuation of common shares show an all-round increase. In the mining, smelting, and manufacturing group, International Nickel, which closed at $66¾, compared with $60 the previous month, is responsible for a large proportion of the increase in the index, but no share in this group has declined and only one remained stationary. In the copper-mining group, Kennecott at over $70 has had a marked effect, but here again the upward tendency has been general, and only three share values have declined and those but slightly. Nevada Consolidated, Calumet and Arizona, and Anaconda have all contributed to the rise in the index, the only tapering in prices being connected with the New Cornelia, Miami, and Copper Range shares. It is interesting to note that shareholders in precious-metal mining companies have apparently refused to allow themselves to be intimidated by the falling off in the price of silver; it might reasonably have been supposed that with the comparative slump in Hollinger and a sharp decline in silver prices the weighted index of this group would have fallen. Such, however, is not the case, and the drop in Hollinger has been more than offset by appreciations in the values of the other securities in the group, notably Lake Shore, which is of course independent of the silver market, and Cerro de Pasco.

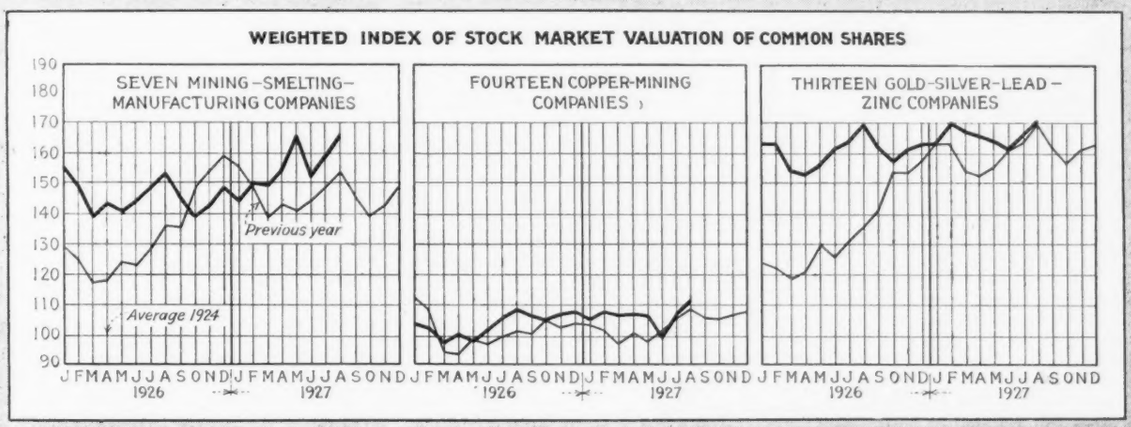
An item of interest with regard to gold may be appended. This precious metal is still coming into the United States, for one reason, because foreign central banks are creating reserve holdings here. These gold imports have helped to lower money rates, and thus to make for increased foreign borrowing. According to the monthly review of the Federal Reserve Bank of New York, complete July figures for the United States show a net gold import of $8,900,000, the result of imports of $10,700,000 and of exports of $1,800,000. The imports included chiefly $4,800,000 from Canada and $4,500,000 from the Netherlands, while exports were principally to Mexico and the Far East. These figures raised the net gold import balance for the first seven months of the year to $140,000,000, and on the basis of preliminary reports for August, the net inflow since the first of the year has been further increased to approximately $145,000,000.

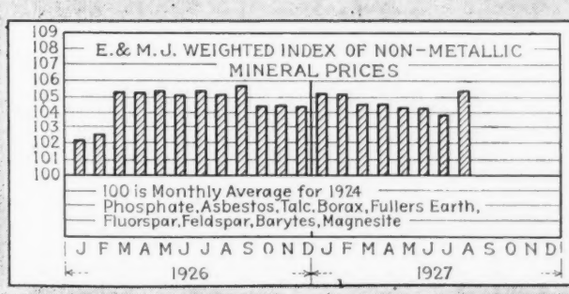
A Correction

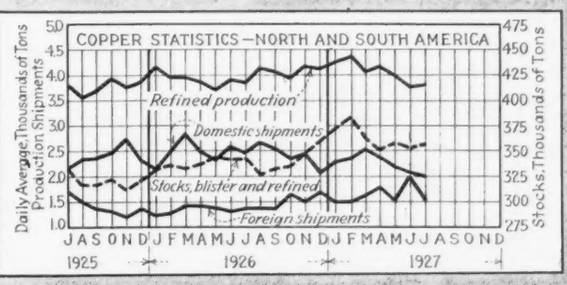
United States imports of lead for the month of June should be 572 tons per day and not 926 as indicated by the curve. The American Bureau of Metal Statistics sent out this correction too late for it to be possible to make a change on the curve before going to press.

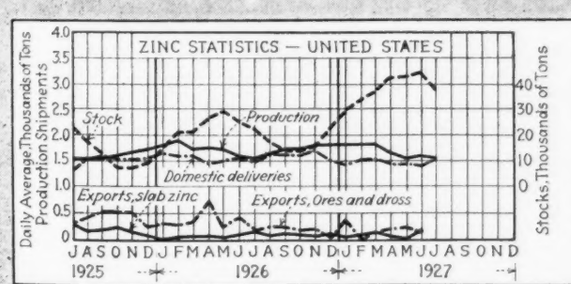
E.&M.J. Statistics of the Mining Industries

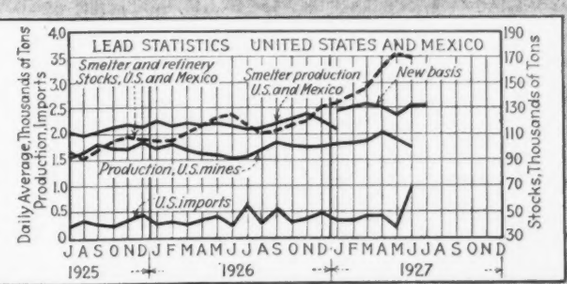

ENGINEERING & MINING JOURNAL'S WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is Composite of Years 1922, 1923, 1924
Copper, Lead, Silver, Zinc, Aluminum, Tin, Nickel
100.01
1920 1921 1922 1923 1924 1925
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.


WEIGHTED INDEX OF STOCK MARKET VALUATION OF COMMON SHARES
SEVEN MINING–SMELTING–MANUFACTURING COMPANIES
FOURTEEN COPPER-MINING COMPANIES
THIRTEEN GOLD-SILVER-LEAD–ZINC COMPANIES
Previous year
Average 1924
J F M A M J J A S O N D J F M A M J J A S O N D
1926
1927


E.& M.J. WEIGHTED INDEX OF NON–METALLIC MINERAL PRICES
100 is Monthly Average for 1924
Phosphate, Asbestos, Talc, Borax, Fullers Earth,
Fluorspar, Feldspar, Barytes, Magnesite
J F M A M J J A S O N D J F M A M J J A S O N D
1926
1927


COPPER STATISTICS—NORTH AND SOUTH AMERICA
Daily Average Thousands of Tons Production Shipments
Stocks, Thousands of Tons
Refined production
Domestic shipments
Stocks, blister and refined
Foreign shipments
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926
1927


ZINC STATISTICS — UNITED STATES
Daily Average Thousands of Tons Production Shipments
Stocks, Thousands of Tons
Stock
Production
Domestic deliveries
Exports, slab zinc
Exports, Ores and dross
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926
1927


LEAD STATISTICS UNITED STATES AND MEXICO
Daily Average Thousands of Tons Production, Imports
Stocks, Thousands of Tons
Smelter and refinery Stocks, U.S. and Mexico
Smelter production U.S. and Mexico
New basis
Production, U.S. mines
U.S. imports
J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D
1925
1926
1927

Mining Stocks—Week Ended Sept. 3, 1927

Stock	Exch.	High	Low	Last		Last	Div
COPPER							
Anaconda	New York	47¼	46¼	46⅞	Jy.16, Au.22	Q	0.75
Arcadian Consol.	Boston	...	...	*75			
Ariz. Com'l	Boston	5⅛	5⅛	5⅛	Jy. 18, Jy. 30		0.25
Calaveras	N. Y. Curb	...	...	1⅞			
Calumet & Arizona	New York	71½	70	70	Se. 9, Se. 26	Q	1.50
Calumet & Hecla	Boston	16¼	15⅛	15⅛	Au. 31, Se.15	Q	0.50
Cerro de Pasco	New York	65	63⅜	65	Jy.14, Au.1	Q	1.00
Chile Copper	New York	36⅛	35⅛	35⅛	Se. 2, Se. 30,	Q	0.62½
Con. Coppermines	N. Y. Curb	2⅞	2⅝	2⅝			
Copper Range	Boston	13⅛	13	13	Ap.2, My.2,	A	1.00
Crystal Copper	BostonCurb	*45	*30	*34			
East Butte	Boston	1⅛	1⅛	1⅛	Dec., 1919		0.50
Granby Consol.	New York	41⅜	40	41	Jn.15 Jy. 1	Q	1.00
Greene Cananea	New York	65	56⅜	64⅝	Nov., 1920		0.50
Howe Sound	New York	40⅛	39⅛	40⅜	Jy.1, Jy.15,	Q	1.00
Inspiration Consol.	New York	19⅝	18⅛	19⅛	Ma.17, Ap.4,	Q	0.25
Iron Cap	Boston Curb	2⅛	2⅛	2⅛			
Isle Royale	Boston	10⅛	10	10	Fe.4, Fe.19,	Q	0.50
Kennecott	New York	72¼	70	72⅛	Se. 2, Oc. 1,	Q	1.25
Magma Copper	New York	37⅛	36⅜	37⅛	Jn.30, Jy.15,	Q	0.75
Mason Valley	N. Y. Curb	75	66	66			
Miami Copper	New York	15	14	14⅜	Au 1, Au.15	Q	0.37½
Mohawk	Boston	44	42	44	Jy.30, Se.1	Q	1.00
Mother Lode Coal	New York	2⅜	2⅛	2⅝	Jn.10, Jn.30		0.25
Nevada Consol.	New York	15⅛	15⅛	15⅜	Jn. 3, Jn. 7	Q	0.37½
New Cornelia	Boston	21⅛	21	21	Au.5, Au.22	Q	0.50
Noranda	N. Y. Curb	24⅛	24	24⅛			
North Butte	Boston	1⅜	1⅛	1⅛	Oct., 1918		0.25
Ohio Copper	N. Y. Curb	1⅛	1 1/16	1 1/16	Sept. 1926		0.03
Old Dominion	Boston	11⅛	11⅛	11⅛	Dec., 1918		1.00
Phelps Dodge	N. Y. Curb	....	....	116	Jn.18, Jy.1	Q	1.50
Quincy	Boston	15⅛	15	15	March, 1920		1.00
Ray Consolidated	New York	15⅛	15⅛	15⅛	Ap.20, Ap. 30		0.25
St. Mary's Min. Ld.	Boston	21	20⅜	20⅜	Fe.10, Ma.10		2.00
Seneca Copper	New York	1⅜	1⅜	1⅜			
Shattuck Denn	Boston Curb	5¼	4	4¼			
Tenn. C. & C.	New York	9⅞	8⅞	8⅞	Au.31,Se.15,	Q	0.12½
United Verde Ex.	N. Y. Curb	24⅜	24⅛	24⅛	Jy.6, Au.1	Q	0.75
Utah Copper	New York	...	...	124	Jn. 17, Jn. 30	Q	1.50
Utah Metal & T.	Boston	1⅛	1⅛	1⅛	Dec., 1917		0.30
Walker Mining	Salt Lake	*53	*53	*53			
NICKEL-COPPER							
Internat. Nickel	New York	68⅜	65½	67	Jn. 16, Jn. 30	Q	0.50
Internat. Nickel pfd.	New York	...	...	108⅜	Ap. 14, My. 2	Q	1.50
LEAD							
Gladstone Mtn.	Spokane	*14⅜	*14⅛	*14⅜	June, 1927		0.005
National Lead	New York	116⅜	113⅜	116	Se. 16, Se. 30	Q	1.25
National Lead pfd.	New York	109⅞	109⅜	109⅜	Se.1, Se. 30	Q	1.75
St. Joseph Lead	New York	41	40⅜	41	Se.10,Se.20,	QX	0.75
ZINC							
Am. Z. L. & S.	New York	7	6	6	May, 1917		1.00
Am. Z. L. & S. pfd.	New York	40	37½	37½	Nov., 1920		1.50
Butte C. & Z.	New York	4	4	4	De. 9, De. 24		0.50
Butte & Superior	New York	9	8⅜	8⅜	Jn. 17, Jn. 30	Q	0.50
Callahan Zn-Ld.	New York	1⅜	1⅛	1⅜	Dec., 1920		0.50
Consol Lead&Zinc'A'	St. Louis	12¼	12⅛	12⅛	Ma.15, Ap.1	Q	0.25
Eagle-Picher	Cincinnati	26¼	26	26⅛	Au.15, Se.1	Q	0.40
Eagle-Picher pfd.	Cincinnati	...	...	117½	Jn.30, Oc.15	Q	1.50
New Jersey Zn.	N. Y. Curb	186½	185	186⅝	Jy.20, Au.10	QX	2.00
United Zinc	N. Y. Curb	...	...	*55			
Yellow Pine	Los Angeles	*38	*37½	*37½	Dec. 1925	Q	0.04
GOLD							
Alaska Juneau	New York	1⅜	1⅛	1⅛			
Argonaut	Toronto	*36	*35	*36			
Barry-Hollinger	Toronto	*38½	*36	*36			
Con.W.Dome L.new.	Toronto	*9	*8½	*8⅜			
Cresson Consol. G.	N. Y. Curb	2¼	2¼	2⅛	Ma.31,Ap.10	Q	0.10
Dome Mines	New York	8⅜	7⅞	8⅛	Jn. 30, Jy. 20	Q	0.25
Golden Cycle	Colo.Springs	†1.84	†1.80½	...	Au.30, Se.10	Q	0.04
Hollinger Consol.	Toronto	17.75	17.20	17.20	Au. 24, Se. 9	F	0.10
Homestake Mining	New York	...	...	61⅜	Au.21, Au. 25	M	0.50
Kirkland Lake	Toronto	2.26	1.90	2.20			
Lake Shore	Toronto	24.85	24.25	24.55	Se.1, Se. 15	X	0.20
McIntyre-Porcupine	New York	25⅛	25⅛	25⅛	Au 1, Se 1	Q	0.25
Portland	Colo.Springs	†*32	†*30	...	Ap.6, Ap.15,	Q	0.02
Rand Mines	New York	...	...	4 5/16	Au.22-29	Am.Sh.	1.52
Teck-Hughes	Toronto	9.30	9.12	9.30	Jy.21, Au.1		0.10
Tom Reed	Los Angeles	*48½	*47½	*47½	Dec., 1926		0.02
Tough-Oakes	Toronto	*30	*28	*30			
United Eastern	N. Y. Curb	...	...	*35	July, 1924		0.05
Vipond Cons.	Toronto	*62	*57	*58	Apr.1, Apr.15		0.03
Wright-Hargreaves	Toronto	7.75	7.00	7.60	Jy.15, Au.1	SA	0.05
GOLD AND SILVER							
Carnegie Metals	Pittsburgh	14⅛	13⅞	14⅛			
Con. Cortez	N. Y. Curb	*18	*18	*18			
Con. Virginia	San Francisco	*5⅛	*3⅛	*5⅛			
Dolores Esperanza	N. Y. Curb	...	...	*50	July, 1923		0.05
Premier Gold	N. Y. Curb	2 7/16	2 5/16	2 5/16	Jn.14; Jy. 5		0.08
Tonopah Belmont	N. Y. Curb	...	...	1⅛	Ma.15, Ap.4		0.08
Tonopah Extension	N. Y. Curb	...	...	*51	Apr. 1925		0.05
Tonopah Mining	N. Y. Curb	2	1⅞	1⅞	Ma.31, Apr.21		0.07½
West End Consol.	N. Y. Curb	...	...	*7	Mar., 1923		0.05
Yukon Gold	N. Y. Curb	...	...	*45	June, 1918		0.02
SILVER							
Beaver Consol.	Toronto	1.75	1.44	1.68	May, 1920		0.03
Castle-Trethewey	Toronto	*72	*70	*70			
Coniagas	Toronto	4.99	4.75	4.85	May, 1924		0.12½
Keeley	Toronto	*93	*80	*83	Se.1, Se.15		0.08
Lorrain Trout Lake	Toronto	*60	*60	*60	July, 1925		0.05
McKinley-Dar.-Sav.	Toronto	*15⅛	*15	*15⅛	Oct., 1920		0.03
Mining Corp. Can.	Toronto.	3.44	3.25	3.30	Jn. 29, Jy.15		0.12½
Nipissing	N. Y. Curb.	5⅞	5⅜	5⅜	Jn.30, Jy.20		0.07½

Stock	Exch.	High	Low	Last		Last	Div
SILVER-LEAD							
Ahumada	New York	6	4⅜	6	Ma. 25,Ap.4,	QX	0.12½
Bingham Mines	Boston	48	48	48	Jn.27, Jy. 5	Q	1.00
Bunker Hill&Sullivan	N. Y. Curb	104⅞	102	102	Jy. 30, Au.4	X	0.75
Cardiff M. & M.	Salt Lake	*41	*40	*40	Feb. 5, 1927		0.10
Chief Consol.	Salt Lake	2.62½	2.62½	2.62½	Nov., 1926	Q	0.10
Consti'nMng.&Mill'g	Spokane	*23	*18	*20			
Erupcion	Boston Curb	*74	*70	*74	Se. 15, Oc.3	Q	0.07½
Eureka Lily	Salt Lake	1.20	1.05	1.10			
Federal M. & S.	New York	...	...	1.46	Jn.25, Jn.29	Spec.	$10
Federal M. & S pfd.	New York	93	93	93	Au. 25, Se.15	Q	1.75
Hecla Mining	N. Y. Curb	16⅛	15⅜	15⅜	Au. 15 Se 15	Q	0.25
Highland-Surprise	Spokane	*11	*9½	*9½			
Iron King Mining	Salt Lake	*51	*51	*51			
Keystone Mining	Salt Lake	*25	*25	*25	Au. 12, Au. 26		0.07½
Lucky Jim	Spokane	*22½	*20½	*22½			
Lucky Tiger-Com.	Kansas City	†7 00	†6 75	...	Sept. 20		0.05
Mammoth Mining	Salt Lake	2.05	2.00	2.00	Jn.10, Jn.20	Q	0.05
Marsh Mines	Spokane	*87½	*75	*75			
North Lily	Salt Lake	3.60	3.57½	3.60			
Park Utah	New York	7⅛	7⅛	7⅛	Jn. 25, Jy. 1	Q	0.20
Plutus Mining	Salt Lake	....	....	2.00	Jy. 10, Jy. 15	Q	0.10
San Rafael	San Francisco	...	...	*24			
Silver King Coal	Salt Lake	9.00	8.70	8.70	Jn. 20, Jy. 1	Q	0.25
Silversmith	Spokane	*22	*16	*19	Oct., 1926	Q	0.02
Strattons Mines	Spokane	*46	*42	*42			
Sunshine M. Co.	Spokane	1.60	1.35	1.58			
Tamarack-Custer	Spokane	*24	*23	*23	Sept., 1924		0.25
Tintic Standard	Salt Lake	12.87½	12.75	12.75	Jn.15, Jn.28		0.40
Utah-Apex	Boston	5	4⅞	4⅞	Oct., 1926		0.25
IRON							
Bethlehem Steel	New York	64½	61⅛	62⅞	Se. 2, Oc. 1,		1.75
Cleveland-Cliffs Iron	Cleveland	103	95	101	Jy. 15, Jy. 25	Q	1.00
Colorado Fuel & Iron	New York	44⅜	78⅛	83⅛	May, 1921		0.75
Gt. North'n Iron Ore	New York	97⅛	96⅛	97⅛	Dec. 6, Dec. 28		0.75
Inland Steel	New York	91	89	90	Au. 15, Se. 1	Q	0.62½
Replogle Steel	New York	...	...	12⅛			
Republic I. & S.	New York	67⅛	66	66⅜	Au. 15, Se. 1	Q	1.00
Republic I. & S. pfd.	New York	104¾	104¾	104¾	Se. 15, Oc. 1	Q	1.75
Sloss-Sheffield S. & I.	New York	128	128	128	Se. 10, Se. 20	Q	1.50
Sloss-Shef. S.&I. pfd.	New York	....	....	107½	Se. 20, Oc. 1	Q	1.75
U. S. Steel	New York	148⅜	142⅜	146¼	Au. 30, Se. 29	Q	1.75
U. S. Steel, pfd.	New York	135⅞	135	135⅞	Au. 1, Au. 30	Q	1.75
Virginia I. C. & C.	New York	....	....	41	Jan., 1924		1.50
Virginia I.C.&C. pfd.	New York	....	....	60½	Ju. 15, Jy. 1		2.50
DIAMONDS, PLATINUM, ALUMINUM, VANADIUM, TIN							
De Beers Consol.	New York	...	...	27½	Jn. 26, Jn.30		1.45
So. Am. G. & P. New.	N. Y. Curb	3	2⅜	2⅜			
Alum. Co. of Amer.	N. Y. Curb	105	98	105			
Alum. Co. of Amer. pf.	N. Y. Curb	104	104	104	Jn. 15, Jy. 1	Q	1.50
Vanadium Corp.	New York	54½	51	54½	Au. 1, Au. 15	Q	0.75
Patino M. & E.	New York	20	19⅛	19⅛	Ap. 27, My. 5		1 sh.
ASBESTOS							
Asbestos Corp.	Montreal	31⅝	27¼	29⅛	Jan., 1926		1.50
Asbestos Corp. pfd.	Montreal	95⅛	92	93	Jn.30, Jy.15	Q	1.75
SULPHUR							
Freeport, Texas	New York	77⅞	73½	77⅛	Jy. 15, Au.1	QX	1.25
Texas Gulf	New York	68⅛	66⅛	68⅛	Ju. 1, Ju. 15	Q	1.00
MINING, SMELTING, REFINING AND GENERAL							
Amer. Metal	New York	44⅛	43	44⅛	Au.20, Se.1	Q	0.75
Amer. Metal, pfd.	New York	....	....	110⅜	Au.22, Se.1	Q	1.75
Amer. Sm. & Ref.	New York	172½	167⅛	172	Jn.8, Au. 1	Q	2.00
Amer. Sm. & Ref. pfd.	New York	128⅝	127⅞	128⅛	Au. 1, Se. 1	Q	1.75
Consol. M. & S.	Montreal	245½	229⅞	240⅞	Jn. 30, Jy. 15	X	6.25
Newmont Mining	N. Y. Curb	104½	95½	104	Jn.30, Jy.15	Q	1.00
U. S. Sm. R. & M.	New York	42⅜	41⅛	42⅛	Jy. 6, Jy. 15	Q	0.87½
U.S. Sm. R.&M. pfd.	New York	50⅛	50	50⅛	Jy. 6, Jy. 15	Q	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. F, four weeks. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Inve.tment Co.; Salt Lake, J. A. Hogle & Co.; Colorado Springs, Colo., Henry Sachs.

LONDON QUOTATIONS—WEEK ENDED AUGUST 23, 1927

Name	High	Low	Last	Date	Amount	Last Div.
Aramayo Mines (25 frs.)	76/3	75/—	76/3	Aug., 1927	5	p.c. (†)
British Platinum (£1)	1/6	1/1½	1/6	Feb., 1925	2½	p.c.
Burma Corpn. (10 rupees)	14/—	13/7½	14/—	Aug., 1927	6	annas*
Bwana M'Kubwa (5s.)	5/—	4/7½	5/—			
Camp Bird (2s)	4/6	4/—	4/—			
El Oro (£1)	3/6	3/3	3/6	Nov., 1924	2½	p.c.*
Esperanza (10s)	—/2⅜	—/1	—/2			
Frontino & Bolivia (£1)	14 7½	13 9	13/9	July, 1927	5	p.c.
Mexican Corpn. (£1)	8/1½	7/6	8/—			
Mexico Mines of El Oro (£1)	15/3	15/—	15/—	Dec., 1926	3¾	p.c.*
N'Changa Copper Mining	9/6	9/—	9/6			
Oroville Dredging (£1)	4/9	4/1½	4/9	Dec., 1923	3¾	p.c.
Ouro Preto (£1)	2/6	2/—	2/—	May, 1925	2½	p.c.
Rhodesian Congo Border (£1)	46/10½	40/—	45/—			
St. John del Rey (£1)	10/9	10/6	10/9	May, 1927	3¾	p.c.
San Francisco Mines (10s)	28/4½	27/7½	28/—	July, 1927	15s.	
Santa Gertrudis (£1)	15/9	15/3	15/6	July, 1927	7½	p.c.
Selukwe (2s. 6d.)	8/4½	8/—	8/3	April, 1917	6¾	p.c.
S. Amer. Copper (2s.)	3/—	2/9	2/9	Nov., 1917	75	p.c.
Tanganyika (£1)	66/6	52/6	55/—	Aug., 1926	7½	p.c.
Union Miniere du Haut-Katanga (Brussels)	9.900	9.760	9.760	July, 1927	182.60	(‡)

* Free of British income tax. † Swiss francs and plus 15 p. c. bonus. ‡ Belgian frs. and free of taxation.

Modern Equipment

New Developments in Diesel Engines

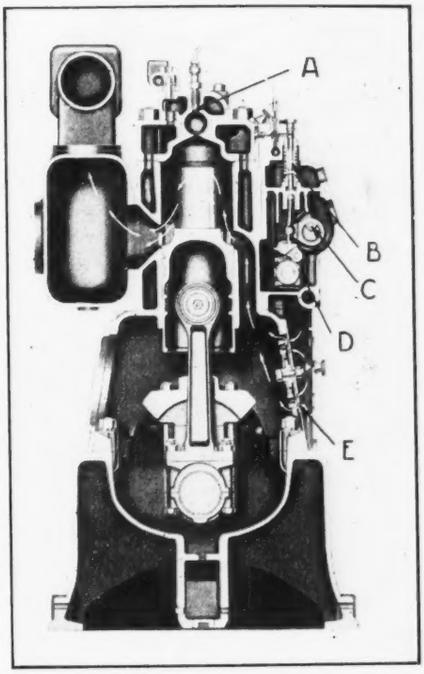
THE last few years have seen interesting developments in the Diesel engine and a widening of its field of application. Sufficient applications have been made to demonstrate that the Diesel engine will produce a horsepower-hour with a fuel and lubricating oil cost of approximately one-half cent or a kilowatt-hour for approximately three-quarters of a cent. With labor and other charges added, the total power cost seldom is more than 1½c. per kilowatt-hour.

Less attention has been given to the development of the smaller units of this type of prime mover than to those of large size. In the last year, however, a number of Diesel engines of higher speed and of lighter weight have been brought out, which are on a competitive basis with gasoline engines of similar sizes. So many places exist where the power problem can be solved by a self-contained prime mover in ratings from about 30 hp. and up, that these new developments are of decided interest.

Illustrating this new trend in the power field is the line of higher-speed and lighter-weight Diesels in ratings from 30 to 180 hp. which has been developed by Fairbanks, Morse & Co. The accompanying cross section through one of these engines shows their simplicity strikingly. In this engine the fuel oil is injected into the combustion space above the cylinder proper by means of a plunger pump which is driven by a cam mounted on a shaft running along the side of the engine about halfway up. This shaft is driven by means of gears from the main crank shaft. One of these plunger pumps is required for each cylinder.

Fuel is sprayed through a nozzle located at the top of the cylinder and the injection of the fuel is timed so that it enters the combustion chamber at about the time the piston reaches the top of its stroke.

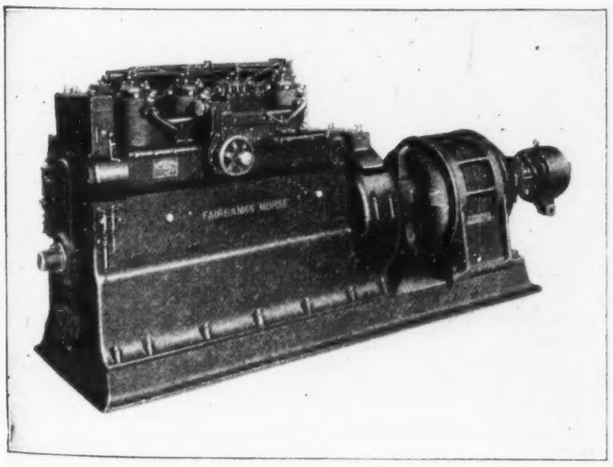
The big difference between the gasoline engine and the Diesel engine is the fact that the Diesel engine ignites the charge of fuel oil by the heat of compression. The compression pressure in a Diesel engine—that is, the pressure of the air at the top of the cylinder when the piston is in its highest position—is about 500 lb. per square inch. In the gasoline engine this pressure is about 50 lb. per square inch. When the air is suddenly compressed to 500 lb. the temperature rises to approximately 1,000 deg. F.



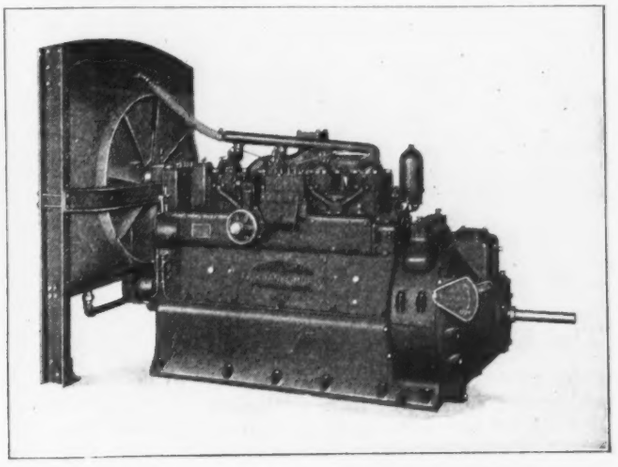
Section through a block-cylinder Diesel
A—Fuel-injection nozzle; *B*—Injection pump plunger; *C*—Governor control shaft; *D*—Injection pump cam; *E*—Air suction valve.

When the fuel in the combustion chamber above the cylinder proper is ignited by the heat of the highly compressed air, the fuel charge begins to burn and the burning gases expand out into the cylinder, driving the piston down. The combustion of the fuel is not rapid, as it is in the case of the gasoline engine. There is no explosive action, but rather a slow burning of the fuel, so that the action is more nearly like that of steam in a steam engine. The piston moves down and first uncovers the edge of the exhaust port and the burned gases expand into the exhaust manifold. As the piston moves on a slight distance further it uncovers the air-inlet port, and the air in the crank case which has been slightly compressed by the downward movement of the piston now flows up through this air-inlet port and blows out the remaining burned gases. The cylinder is now charged with a fresh supply of air, the piston begins to move upward, closing the air inlet and exhaust ports, and the cycle is repeated. As the piston moves up a new supply of fresh air is drawn through the valves in the crank case.

This is all there is to the operation of a modern two-cycle, airless injection Diesel engine. There are, however, other types of Diesel engines, such as the four-cycle air injection type. The four-cycle engine requires both inlet and exhaust valves, which require proper setting to produce the best efficiency and which must be frequently ground to keep the engine in operating condition. The air-injection Diesel requires the use of high-pressure air for atomizing the fuel oil. That is, in this type of engine, air at about 1,000 to 1,200 lb. pressure is carried to the tip of the injection nozzle and the fuel is suddenly blown into the engine and atomized by this method. In this case the fuel is usually blown directly into the cylinder itself.



A block-design Diesel engine with direct-connected a.c. generator and exciter



A 60-hp. 800-r.p.m. Diesel unit with radiator cooling and built-in clutch

By using the combustion chamber just above the cylinder the same effect is obtained as when high-pressure air is used but without having the added complication of a multistage air compressor.

The big advantage of the Diesel engine is the low fuel cost. The full Diesel, that is the high-compression type, will burn very low grades of fuel and will burn them more efficiently than the lower compression or semi-Diesel types of engine. It is readily seen that the higher the compression, the higher the generating temperature and hence the more complete is the burning of the fuel. It is for this reason that the Diesel engine is so much more efficient than the gasoline engine. The gasoline engine not only requires a higher grade of fuel, but because it burns it much less efficiently than does the Diesel engine, it requires a great deal more fuel. Fuel for Diesel engines can be purchased for from 3 to 8c. per gallon, depending on the locality and the quantity which is bought.

At one time the Diesel engine was not as flexible in operation as was its competitor the gasoline engine. The latest Diesels are greatly improved in this respect until they will throttle down in much the same way that a gasoline engine will.

The new Fairbanks-Morse Diesel is equipped with both manual and governor control. In this control a half turn of the small regulator shown just a little above the center of the engine will vary the speed through a wide range. Where the engine is to be operated for long periods at a slow speed the governor control wheel is turned and the engine operates at this slow speed under governor control—that is, the speed will not vary over or under the speed for which the governor is set. This particular feature is exceptionally important where the engine is used for such service as a power shovel, but it is also useful in varying the voltage or frequency on direct and alternating current generating sets.

These engines are started with compressed air at a pressure of about 250 lb., which is supplied by a small air compressor and stored in small tanks. The engines start instantly and the starting of the largest Diesel engine is easier than starting an automobile engine.

The reliability of Diesel engines, it is asserted, has been greatly improved in the last few years by improved manufacturing methods. As much progress has been made in the building of Diesel engines as in the building of automobile engines. In fact, is is claimed that the modern Diesel engine is as well built as the engine in the highest-priced automobile.

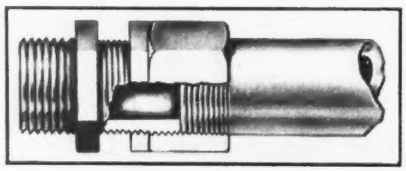
The Largest Thickener Built

An example of engineering progress and success in building large equipment to meet the increasing tonnage requirements of modern industry has come to light in the purchase recently of the largest Dorr thickener ever built. This thickener, which is of the traction type, is 325 ft. in diameter. Some conception of its size may be obtained when it is realized that it will provide almost two acres of settling area.

This unit will be used at the copper flotation plant of the Miami Copper Co., at Miami, Ariz., for dewatering 16,000 tons of mill tailing and recovering for re-use in the plant about 11,500,000 gallons of water per day. It has more than twice the capacity of any thickener built before. With the exception of certain improvements, the design closely follows that of the 200-ft. units at the plant of the Inspiration Copper Co., which have been operating several years in the same district.

This Union Is Self-Threading

A substantial water-tight connection with a perfect ground bond may be made with a Crouse-Hinds Type CCU self-threading union where it is not convenient to thread the conduit, according to the manufacturers. No



A self-threading union

endwise movement of the conduit is required to make up this union, and the conduit may therefore be cut to the exact length to fit between two fixed positions. The male end is a pipe thread nipple to take any standard threaded device. The nut has a self-threading feature so that it threads itself onto the pipe and a lock nut securely locks it in position.

This Speed Reducer Intended for All Service

A NEW speed reducer that can be economically applied to all classes of service, no matter how light or heavy it may be, has recently been introduced by the Link-Belt Co., of Chicago. Distinct advantages are quietness of operation, high efficiency, and ability to withstand shocks.

Three standard units have been developed to cover a wide range of ratios and capacities. The single-reduction unit, designated as Type S, covers ratios up to 10 to 1. Types D and DV are double reduction units. Type D is designed for heavy duty, and ratios are from 10 to 1 up to 80 to 1. Type DV is a light-duty reducer. Ratios range from 10 to 1 up to 130 to 1.

Link-Belt Sykes herringbone gears are the backbone of this reducer. The teeth run continuously across the face of the gear, giving a good bearing service with the several teeth engaged. In this reducer pinions are of heat-treated alloy steel cut integral with the shaft.

The unit has a minimum number of parts. Oversize tapered roller bearings are used. Gears rotate within a large oil reservoir and bearings are splash-lubricated. This provides ample lubrication. Special oil baffles at shaft projections keep dust out and oil in. The housing is free from troublesome oil grooves and oil wipers.

Rigid construction insures proper alignment of parts and a base plate is furnished when required that maintains alignment of the reducer and its motor.

Arc-Welded Synchronous Motor for Low-Speed Machinery

RECENTLY, a new low-speed synchronous motor, called the Type HR, was placed on the market by the Westinghouse Electric & Manufacturing Co. It is asserted by the makers that this motor is the most modern and highly developed drive yet devised for slow-speed machinery where direct connection is applicable. Though arc-welding has been used to some extent in Westinghouse motors for fifteen years, it reaches its greatest application in this motor. Its parts have been specially designed for ease in handling and ease in assembling in the field.

The new motor has been designed for high efficiency at all loads within its normal operating range. High efficiency at fractional loads is a great power saver, because few applications require the maximum output of the motor. The excitation has been materially reduced, thus increasing the efficiency and cutting operating costs. A difference of 1 per cent in efficiency on a 200-hp. motor running twenty-four hours a day for 250 days a year means a difference of $250 with power at 3 cents a kilowatt.

A starting torque of 50 per cent and a pull-in torque of 40 per cent are features of this new motor. The higher the starting torque, the quicker the motor will come up to normal running synchronous speed. The disturbance on the line is correspondingly reduced. This torque, being higher than usual, is also a valuable asset under such unusual conditions as starting a machine while it is still new and stiff or after it has been standing for a considerable time.

Low-speed motors naturally have little windage effect, so that cooling is effected largely by radiation. As heat has a deteriorating effect on insulation, a cool-running motor will have a long life. The shape of the motor arms in this new motor is such that a large amount of air is set in motion. This cooling air is so directed that it not only passes through the stator coils but it also passes over a large area of the stator laminations as well.

A means of varying the flywheel effect is an attractive feature of the motor. By means of different weight rings bolted to the rotor rim, six possible values of flywheel effect are available.

The new motor is considered desirable for driving air compressors, pumps, and other slow-speed machinery.